Contract No. 68-W-98-210

RAC II

Final Remedial Investigation Report
Old Roosevelt Field Contaminated Groundwater Site
Remedial Investigation/Feasibility Study
Garden City, New York
Work Assignment No.: 146-RICO-02PE

Volume 1

Remedial Response, Enforcement Oversight and Non-time Critical Removal Activities at Sites of Release or Threatened Release of Hazardous Substances in EPA Region II

CDM

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Volume 1

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July 24, 2007

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Project:	RAC II Contract No.: 68-W-98-210 Work Assignment: 146-RICO-02PE
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Subject:	Final Remedial Investigation Report Old Roosevelt Field Contaminated Groundwater Site Remedial Investigation/Feasibility Study Garden City, New York

Dear Ms. Kwan:

CDM Federal Programs Corporation (CDM) is pleased to submit the Final Remedial Investigation Report for the RI/FS for Old Roosevelt Field Contaminated Groundwater Site in Garden City, New York. Comments were received from various reviewers during the period from January 3 to July 5, 2007. Per your request, the report will be distributed to recipients on a list provided to CDM.

If you have any comments concerning this submittal, please contact me at (212) 785-9123 or Ms. Susan Schofield at (203) 262-6633.

Very truly yours,
CDM FEDERAL PROGRAMS CORPORATION

Jeanne Litwin, REM
RAC II Program Manager

cc: F. Rosado, EPA Region II (letter only)
L. Campbell, CDM
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S. Schofield, CDM
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RAC II Document Control

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Acronyms

amsl	above mean sea level
ARARs	applicable or relevant and appropriate requirements
ARM	ARM Group, Inc.
atm-m^3/mol	atmosphere-cubic meter per mole
bgs	below ground surface
c	circa
CDM	CDM Federal Programs Corporation
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
CLP	Contract Laboratory Program
COPC	contaminant of potential concern
cps	counts per second
CRQL	contract-required quantitation limit
CSM	conceptual site model
CT	central tendency
1,1-DCE	1,1-dichloroethene
DESA	Division of Environmental Science and Assessment
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DQO	data quality objectives
EGIS	Environmental Geographic Information System
Eh	oxidation-reduction potential
EPA	Environmental Protection Agency
FCR	field change request
Fe^{+2}	ferrous iron
FS	feasibility study
ft/d	feet per day
ft^2/d	square feet per day
ft/min	feet/minute
f_{OC}	fraction of organic carbon
gpd	gallons per day
GPR	ground penetrating radar
GPS	global positioning system
GWM	groundwater sample from multi-port well
GWP	groundwater sample from Village of Garden City supply well
GWX	groundwater sample from existing well
HACH	HACH Company
Hg	mercury
HHRA	human health risk assessment
HSA	hollow stem auger
H_2S	hydrogen sulfide
ID	inner diameter
IDW	investigation derived waste
JMA	John Milner Associates
K	hydraulic conductivity
Kd	distribution coefficient

K_{OC}	organic carbon partition coefficient
K_{OW}	octanol-water partition coefficient
LDL	low detection limit
LIRR	Long Island Railroad
MCL	Maximum Contaminant Level
MEE	methane/ethane/ethene
mgd	million gallons per day
mg/L	milligrams per liter
MHZ	megahertz
mL	milliliter
mL/g	milliliter per gram
mm Hg	millimeters of mercury
MS/MSD	matrix spike/matrix spike duplicate
MTBE	methyl tert butyl ether
NAF	Naval Air Facility
NCDH	Nassau County Department of Health
NCDPW	Nassau County Department of Public Works
NCP	National Contingency Plan
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity unit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	oxidation reduction potential
PAR	Pathways Analysis Report
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
ppb	parts per billion
ppbv	parts per billion per volume
PRG	preliminary remedial goals
psi	pounds per square inch
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
RAC	Response Action Contract
RAGS	Risk Assessment Guidance for Superfund
RAS	routine analytical services
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
RME	reasonable maximum exposure
SGHP	soil gas sample from Hazelhurst Park
SGRF	soil gas sample from Roosevelt Field
SLERA	screening level ecological risk assessment
SVOC	semivolatile organic compound
SVP	screening vertical profile boring
TAL	target analyte list
TBC	To Be Considered
TCE	trichloroethene
TCL	target compound list
TDS	total dissolved solids

TOC	total organic compound
TSS	total suspended solids
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
UCL	upper confidence limit
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
uV	ultraviolet
v	velocity
VOC	volatile organic compound
1,2-DCE	1,2-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane

Executive Summary

Executive Summary

CDM Federal Programs Corporation (CDM) received Work Assignment 146-RICO-02PE under the Response Action Contract (RAC) to perform a remedial investigation/ feasibility study (RI/FS), a human health risk assessment (HHRA), and a feasibility study (FS) at the Old Roosevelt Field Contaminated Groundwater Site (the Roosevelt site), located in Garden City, Nassau County, New York, for the Environmental Protection Agency (EPA).

Purpose of Report

The purpose of the RI Report is to present the results of the hydrogeologic and source area soil gas investigations, which included groundwater screening, multi-port well installation, downhole geophysical logging, groundwater sampling, soil gas screening, soil gas sampling, and a cultural resource survey. The hydrogeologic and source area soil gas investigations were conducted to determine the nature and extent of site-related contamination.

Site Description

The Roosevelt site is an area of groundwater contamination within the Village of Garden City, in central Nassau County, New York. The site is located on the eastern side of Clinton Road, south of the intersection with Old Country Road; it includes the area of the former Roosevelt Field airfield. The former Roosevelt Field airfield site area is currently developed as a large retail shopping mall with a number of restaurants, and a movie theater. A thin strip of open space along Clinton Road (known as Hazelhurst Park) serves as designated parkland and a buffer with the residential community. Several office buildings (including Garden City Plaza) are on the western perimeter of the mall and share parking space with the mall. Two recharge basins are directly east and south of the mall area. The eastern basin, Pembrook, is on property owned by the mall. The basin to the south is Nassau County Storm Water Basin number 124.

Two municipal supply well fields are located south (downgradient) of the site. The Village of Garden City public supply wells (designated as wells 10 and 11) are located just south of the site boundary, on the eastern side of Clinton Road. The Hempstead well field is located approximately 1.5 miles south of the Garden City supply wells.

Site History

The Roosevelt site was used for aviation activities from 1911 to 1951. The United States (U.S.) military began using the Hempstead Plains field prior to World War I to train Army and Navy officers and as a training center for military pilots. In 1918, the Army changed the name of the airfield to Roosevelt Field.

After the first World War, the U.S. Air Service authorized aviation-related companies to operate from Roosevelt Field, but maintained control until July 1, 1920, at which time the Government sold its buildings and relinquished control of the field. Subsequently, the property owners sold portions along the southern edge of the field and split the remainder of the property into two flying fields. The eastern half continued as Roosevelt Field, and the western half became known as Curtiss Field.

Both fields were bought in 1929 by Roosevelt Field, Inc., and the property was once again called Roosevelt Field.

During World War II, Roosevelt Field was again used by both the Army and Navy. The Army used the field to provide airplane and engine mechanics training to Army personnel. As of March 1942, there were 6 steel/concrete hangars, 14 wooden hangars, and several other buildings at Roosevelt Field, which were used to receive, refuel, crate, and ship Army aircraft. In November 1942, the Navy Bureau of Aeronautics established a modification center at Roosevelt Field to install British equipment into U.S. aircraft for the British Royal Navy. The Navy was responsible for aircraft repair and maintenance, equipment installation, preparation and flight delivery of lend-lease aircraft, and metal work required for the installation of British modifications. The facility also performed salvage work of crashed Royal Navy planes. The Navy vacated all but six hangars shortly after the war ended. In August 1946, Roosevelt Field again operated as a commercial airport until it closed in May 1951.

Soon after the airfield closed, industrial plants for precision electronic instruments were under construction at Roosevelt Field and further development was planned. The large Roosevelt Field Shopping Center was constructed at the site and opened in 1957. Three of the old Navy hangars remained standing until some time after June 1971, with various occupants, including a moving/storage firm, discotheque, amusement center, and bus garage.

Chlorinated solvents such as tetrachloroethene (PCE) and trichloroethene (TCE) have been widely used for aircraft manufacturing, maintenance, and repair operations since the late 1930s. Several military instruction manuals for aircraft maintenance and repair from this time period specify the use of TCE. Military records indicate these types of aircraft were present at Roosevelt Field during World War II; therefore, use of chlorinated solvents was likely to have occurred.

Subsequent to military use of the site, the airfield was developed into a regional mall and office complex. Carbon tetrachloride observed in some groundwater samples at the site likely originated from the use of groundwater in building cooling systems and subsequent discharge of the contaminated water.

Wells 10 and 11 were installed in 1952, at what had been the southwest corner of the airfield, and were put into service in 1953. Well 10 is screened from 377 to 417 feet below the ground surface (bgs) and well 11 is screened from 370 to 410 feet bgs. Both wells had shown the presence of PCE and TCE since they were first sampled in the late 1970s and early 1980s, and concentrations increased significantly until 1987, when an air-stripping treatment system was installed at the site. Sampling results of treated well water from May 1993, September 1995, and June/July 1999 indicated that breakthrough of the treatment system had occurred. The highest levels of volatile organic compound (VOC) contamination were noted during the mid-to late 1990s, and have steadily declined since then.

Previous Investigations

Several investigations of groundwater contamination in the vicinity of the Roosevelt site have been conducted, as described below.

Roosevelt Field Groundwater Contamination Study - Nassau County Department of Health (NCDH), Geraghty & Miller, 1986. This study indicated that pumping from the Magothy aquifer by non-contact cooling water wells and discharge of the spent cooling water to Pembroke Basin significantly affected seasonal water table elevations. Vertical flow was occurring between the water table aquifer and the underlying principal municipal water aquifer at Roosevelt Field. A cone of depression around the Village of Garden City supply wells appeared to have a strong influence on the movement of contaminants. The highest contamination detected in deep wells at Roosevelt Field was found in cooling water well N8050 (40,890 parts per billion (ppb) total VOCs) located near the northwest corner of the shopping center.

Environmental Assessment Report - Subsurface Investigation for Soil Contamination for the Proposed Clinton Road/Stewart Avenue Bypass at Roosevelt Field - Nassau County Department of Public Works (NCDPW). Eighteen shallow and 11 deep borings were installed in the western section of the site to provide an assessment of the potential impact from excavation of contaminated soil during construction of a new road. None of the samples collected from the 29 soil borings had detections of the contaminants of concern (CDM 1987).

United States Geological Survey (USGS) Water Resources Investigation 86-4333, 1989. From March 1982 through September 1984, the USGS, NCDH, and NCDPW completed a study to evaluate the occurrence and movement of VOCs in the groundwater at Roosevelt Field. Sampled wells included 52 monitoring wells, 28 public supply wells and 25 cooling water wells in a 10 square mile area. Seven additional shallow and two deep Magothy Aquifer wells were installed. The USGS identified three separate plumes of chlorinated VOCs (TCE, PCE, and degradations products) emanating from the Roosevelt Field area (Eckhardt, *et al.* 1989).

Field Report Summary, New York Superfund Standby Contract, Garden City Schools Field Investigation. In 1993, the New York State Department of Environmental Conservation (NYSDEC) performed soil vapor sampling at Stewart School located approximately 3,000 feet southwest and hydraulically downgradient from Roosevelt Field. Five soil vapor samples were collected from 10 feet below grade around the perimeter of the Stewart School (5-10 feet from the building). Groundwater samples also were collected at each soil gas sampling location. No VOCs or chlorinated VOCs were detected in groundwater or soil vapor (H2M 1993).

Study Area Investigations

The RI field activities included a hydrogeological investigation and a source area soil gas investigation. All work, except where noted in the text of the report, was performed in accordance with documents approved by EPA. Activities performed are listed below.

Hydrogeological Investigation
- Conducted a geophysical utility survey
- Collected discrete-depth groundwater screening samples for 24-hour turnaround VOC analysis to assist in selection of multi-port well screen intervals in 8 wells
- Conducted borehole natural gamma logging in multi-port well borings
- Installed and developed 4-inch diameter outer screen and casing assemblies to support the multi-port well equipment
- Installed multi-port well equipment
- Collected two rounds of hydrostatic pressure and synoptic water level measurements
- Re-developed select existing monitoring wells
- Collected groundwater samples from multi-port monitoring wells and select existing monitoring wells

Source Area Soil Gas Investigation
- Conducted geophysical utility survey
- Installed temporary soil gas points and conducted soil gas screening in the source area at 158 locations at two depths: 15 feet bgs and 35 feet bgs
- Collected 36 soil gas samples adjacent to three office buildings and along Clinton Road (Hazelhurst Park)

An ecological investigation and a Stage 1 cultural resources survey were also conducted.

Physical Characteristics of the Study Area

Surface Features
The site is located within the Atlantic Coastal Plain of New York. The topography of the central portion of Nassau County is characterized by a gently southward-sloping glacial outwash plain. The site is flat to gently undulating with slopes from approximately 100 feet above mean sea level (msl) at the northern edge of the site (along Old Country Road) down to approximately 70 feet above msl about 4,000 feet south-southwest of Roosevelt Field, along Clinton Road.

Soils
According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey of Nassau County, the following five classified soil types are expected to occur onsite: Urban Land, Pits/groundwater recharge, Hempstead Series, Mineola Series, and Riverhead Series.

Geology
The site is located within the Atlantic Coastal Plain Physiographic Province. The geology of Long Island is characterized by a southeastward-thickening wedge of unconsolidated sediments unconformably overlying a gently-dipping basement bedrock surface. The wedge ranges in thickness from zero feet beneath Long Island Sound to the north, on the submerged western margin of the Coastal Plain, to more

than 2,000 feet under the southern shores of Long Island. In the vicinity of the Roosevelt site the sedimentary units thicken from about 800 feet at the northern edge of the Town of Hempstead to approximately 1,500 feet thick beneath the barrier islands.

The geologic units consist of:

- Basement - Precambrian to Early Paleozoic igneous or metamorphic bedrock
- Raritan Formation - Cretaceous Lloyd Sand Member (sand and gravel) and the overlying Raritan Clay Member (clay and silt)
- Magothy Formation - Cretaceous fine to medium quartz sand, interbedded clayey sand with silt, clay, and gravel interbeds or lenses
- Pleistocene Deposits - the fluvial Jameco Gravel, the marine Gardiners Clay, and the Upper Glacial deposits

The Pleistocene sediments and the Magothy Formation are the geologic units of interest for the Roosevelt site.

Hydrogeology

The Upper Glacial and Magothy aquifer is unconfined and form a single aquifer unit, although with different properties. They are the most productive and heavily utilized groundwater resource on Long Island. Average transmissivities are 32,160 square feet per day (ft^2/d) for the Magothy aquifer and 26,800 ft^2/d in the Upper Glacial aquifer. Average hydraulic conductivities are 228 feet per day (ft/d) in the Upper Glacial and 174 in the Magothy (Krulikas 1987b).

Horizontal velocity in the Upper Glacial aquifer generally ranges from 1 to 2 feet/day (ft/d). Based on site-specific values, the average horizontal flow rate for the Magothy is 1.8 ft/d, although literature values are estimated to be 0.3 ft/d. Based on measurements in the eight multi-port wells and the existing wells, groundwater flow is to the south. Pressure measurements in the ports indicate the vertical groundwater flow is downward.

Meteorology

The Village of Garden City in Hempstead Township is located on west-central Long Island, southeastern New York, where the climate is temperate maritime. Climate is more influenced by the ocean than by the adjacent mainland. It is characterized by mild winters and relatively cool summers, and is free from sudden or extreme changes in temperature. Precipitation is the only source of freshwater for streams and groundwater in the Hempstead area. Average precipitation is about 42 inches per year.

Surface Water Hydrology

No naturally-occurring surface water bodies are present in the vicinity of the Roosevelt site. In general, the sandy nature of natural soils on Long Island promotes fast infiltration of precipitation (rainwater) from the ground surface.

Population and Land Use

The Roosevelt site is located in a very densely developed portion of Nassau County, a mixed commercial-residential area, covering portions of the villages of Garden City and Hempstead within the Town of Hempstead.

Ecological Characterization

An ecological reconnaissance was performed on September 7, 2006, and is described below.

Habitat and Biota

The majority of the site is heavily urbanized and developed; however, small areas of heavily disturbed habitat are situated within the site boundaries. Throughout the recharge basin areas, evidence of disturbance activities including the placement/disposal of fill material, excavating, dumping of construction debris and miscellaneous refuse (e.g., bottles, tires, bags) was observed.

Vegetative communities observed reflected those indicative of disturbed and waste areas, and consisted of native and invasive species commonly found in urbanized areas.

No standing water was present within the central portion of Nassau County Basin at the time of the ecological characterization; however, some surface water was present within the northwest corner. Standing water was present within a portion of the Pembrook Basin. Evidence such as drift lines and debris suggest that water levels often fluctuate. The complete lack of both submergent and emergent aquatic vegetation suggest that the basin is often dry, most likely through evaporation and the sandy substrate which allows water to quickly percolate to the groundwater table. No fish or amphibians were observed in or near the water. No evidence of groundwater discharges were present in this area.

Threatened, Endangered and Rare Species, and Sensitive Environments

NYSDEC records for a two-mile radius indicated eight threatened, four endangered, and one unlisted species occur in the area. However, during the ecological reconnaissance in September 2006, none of these species were observed at or near the Roosevelt site.

Nature and Extent of Contamination

Groundwater and soil gas detections were evaluated by comparing the sampling results against applicable screening criteria.

Selection of Site-Related VOCs

Site-related VOCs were selected based on historical data, since sampling of the nearby Village of Garden City supply wells has occurred on a regular basis for more than 20 years. The site-related VOCs are TCE, PCE, 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), and carbon tetrachloride.

Site-Specific Screening Criteria

Groundwater: Applicable or relevant and appropriate requirements (ARARs) for groundwater include EPA's National Primary Drinking Water Maximum Contaminant Levels (MCLs), New York State Standards and Guidance Values for Class GA Groundwater (Human Water Source), and NYSDOH Drinking Water Quality Standards. The most stringent value was used as the site-specific groundwater screening criteria.

Soil Gas Screening Criteria: Soil vapor screening criteria were selected from Table 2c in the EPA 2002 document titled *"Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soil"*.

Groundwater Contamination

Site-related VOC contamination is evaluated in groundwater samples collected in the 8 vertical profile borings, 68 ports in the multi-port wells, 9 existing monitoring wells, and 2 Village of Garden City supply wells.

Groundwater Screening Vertical Profile Results

Screening samples at 20-foot intervals at each screening vertical profile (SVP) boring for VOC analysis with 24-hour turnaround time for results. Port locations for the multi-port wells were based on an evaluation of the screening results and were approved by EPA. In general, ports were placed in three zones in each multi-port well, as follows: at the top of the water table (approximately 50 feet bgs), at the top of the Magothy Formation (approximately 100 feet bgs), and at the deepest point in the boring (approximately 450 feet bgs). All other port locations were selected based on contaminant levels in each SVP.

Multi-port Well Sample Results

Two rounds of VOC samples were collected from the eight multi-port monitoring wells. Round 1 was collected in March 2006 and Round 2 was collected in July 2006. Overall, the highest concentrations of site-related VOCs are found in SVP/GWM-4, at a depth of approximately 250 feet bgs.

SVP/GWM-1

The majority of results in the upgradient background well were non-detect, although some low levels of chlorinated VOCs were detected in the deeper portions of the well. All detections of VOCs were below the screening criteria values of 5 micrograms per liter (µg/L). Chlorinated VOCs that were detected include PCE (non-detect to 0.38 J µg/L), TCE (non-detect to 2.4 µg/L), and 1,1-DCE (non-detect to 4 µg/L). Cis-1,2-DCE and carbon tetrachloride were not detected. These VOCs are the same as those found at the site; however, as they are upgradient from the site they are from source(s) other than the site.

SVP/GWM-2

SVP-GWM-2 is located near 100 Ring Road, near the former cooling water well N8050. Overall concentrations of site-related VOCs are much lower than historic levels in N-8050, including PCE (0.14 J to 5.8 µg/L), TCE (1 to 38 J µg/L), cis-1,2-DCE (0.14 J to 10 µg/L), 1,1-DCE (0.41 J to 0.46J) and carbon tetrachloride (non-detect to 0.14J).

SVP/GWM-3

SVP/GWM-3 is located in the Roosevelt Field Mall parking lot, east of the most contaminated multi-port well (SVP/GWM-4). TCE is the only contaminant that exceeded screening criteria. Results include PCE (non-detect to 0.72 µg/L), TCE (non-detect to 14 µg/L, 1,1-DCE (non-detect to 1 µg/L), cis-1,2-DCE (non-detect to 0.8), and carbon tetrachloride (non-detect to less than 1 µg/L).

SVP/GWM-4

SVP/GWM-4 is located just west of 200 Garden City Plaza. It is the most contaminated well in the multi-port well network, with the bulk of contamination found in the middle portion of the well. Site-related VOC detections include PCE (0.31 J to 350 µg/L), TCE 1.3 to 280 µg/L, cis-1,2-DCE (0.1J to 9.7 µg/L), 1,1-DCE (non-detect to 9.7 µg/L) and carbon tetrachloride (non-detect to 2.9 µg/L).

SVP-GWM-5

SVP/GWM-5 is located in Garden City Plaza, southeast of SVP/GWM-4. Higher levels of VOC contamination are found in the deeper half of SVP/GWM-5, specifically in port 2. Site-related VOC detections include PCE (0.11J to 0.95), TCE (0.11J to 32 µg/L, cis-1,2-DCE (non-detect to 2.9 µg/L) and 1,1-DCE (non-detect to 2.8 µg/L).

SVP-GWM-6

SVP/GWM-6 is located in a residential area on Meadow Street. It is downgradient of the Roosevelt Field source area, and is also downgradient of two other contaminant sites (Pasley and Purex) in the area. This well was installed as one of two sentinel wells for the Hempstead well field. The highest levels of site-related VOCs were generally found in shallower zones of this well. Since the contamination in the Roosevelt Field source area is concentrated in deeper zones than contamination in this well, the contamination in SVP/GWM-6 may have originated from a source other than the Roosevelt site. The site-related VOC detections include PCE (non-detect to 1.1 µg/L), TCE (non-detect to 8.2 µg/L), 1,1-DCE (non-detect to 22 µg/L), cis-1,2-DCE non-detect to 22J µg/L) and carbon tetrachloride (non-detect to 1 µg/L).

SVP/GWM-7

SVP/GWM-7 is located in a residential area west of Commercial Avenue, along the former Long Island Railroad (LIRR) tracks. Site-related VOC detections include PCE (non-detect to 7.7 µg/L), TCE (non-detect to 20 µg/L), 1,1-DCE (non-detect to 5.2 µg/L), and cis-1,2-DCE (non-detect to 3.9 µg/L). Carbon tetrachloride was not detected in any of the samples from this well.

SVP/GWM-8

SVP/GWM-8 is the furthest downgradient multi-port well from the Roosevelt Field source area, and is due west of SVP/GWM-6. This well was installed as the main sentinel well for the Hempstead well field. It is located one block north (upgradient) of the Hempstead well field, in a residential area on the corner of Clinton Road and Meadow Street. The highest levels were found in shallower zones of this well, specifically in port 5. As in SVP/GWM-6, the contamination in SVP/GWM-8 may have originated from a source other than the Roosevelt site. Site-related VOC detections include PCE (0.92 to 57 μg/L), TCE (non-detect to 3.2 μg/L), and cis-1,2-DCE (non-detect and below 1 μg/L). 1,1-DCE and carbon tetrachloride were not detected in any samples at this well.

Existing Monitoring Well and Supply Well Sample Results

Two rounds of VOC data (Round 1 in March 2006 and Round 2 in July 2006) were collected from nine existing monitoring wells and two Village of Garden City supply wells. Four of the existing wells are completed in the shallow portion of the aquifer in the Upper Glacial deposits. Shallow existing wells include: GWX-9953, located in Hazelhurst Park, east of SVP/GWM-2; GWX-9966, located adjacent to Pembrook Basin southwest of the Roosevelt Field Mall; GWX-10035, located downgradient of the Roosevelt Field source area, east of SVP/GWM-7 on the corner of Commercial Avenue and Clinton Road; and GWX-9398, located further downgradient, just west of SVP/GWM-8, on the corner of Meadow Street and Clinton Road. Site-related VOCs were either not detected or detected at very low levels, below the screening criteria.

The remaining five existing wells and the two Village of Garden City supply wells are completed in the Magothy Formation, with total depths ranging from 190 to 556 feet bgs. The existing Magothy wells include: GWX-10019 (223-228 feet bgs), located west of SVP/GWM-5; GWX-10020 (185-190 feet bgs), located on the southern side of the Garden City Plaza parking lot, adjacent to Ring Road; GWX-8068 (265-291 feet bgs), located in the office building at 585 Stewart Avenue, near the southern mall entrance; and GWX-8474 (485-556 feet bgs) and GWX-8475 (409-481 feet bgs), both located inside a pump house on Oak Street, west of SVP/GWM-6. Site-related VOCs were detected in these five existing wells, and in the two Village of Garden City supply wells, with many levels exceeding screening criteria. Site-related VOC data is summarized below for the five deep existing Magothy wells and the two Village of Garden City supply wells:

<u>GWX-10019</u>

During Rounds 1 and 2, TCE was detected at 260 μg/L and 170 μg/L, respectively and cis-1,2-DCE was detected at 21 μg/L and 23 μg/L, respectively. PCE was detected at 2 μg/L and 2.2 μg/L, respectively. Carbon tetrachloride was detected at 0.2J and 0.28J μg/L, respectively. 1,1-DCE was not detected.

<u>GWX-10020</u>

PCE was detected at 1.3 μg/L (Round 1); TCE at 1.6 μg/L (Round 1) and 0.14J μg/L (Round 2); and cis-1,2-DCE at 0.19J μg/L. 1,1-DCE and carbon tetrachloride were not detected in GWX-10020.

<u>GWX-8068</u>

GWX-8086 was only sampled during Round 2. PCE was detected at 170 μg/L, TCE at 54 μg/L, 1,1-DCE at 17 μg/L, cis-1,2-DCE at 5.3J μg/L, and carbon tetrachloride at 0.44J μg/L.

<u>GWX-8474 and GWX-8475</u>

In GWX-8474, PCE and TCE were detected at 5.8 and 29 μg/L during Round 1 and at

6.3 and 25 µg/L during Round 2. 1,1-DCE and carbon tetrachloride were detected only during Round 2, at 7.4 µg/L and 0.42J, respectively. Cis-1,2-DCE was detected during both rounds, at 0.76 and 1.4J µg/L, respectively.

In GWX-8475 PCE was detected at 5.5 µg/L (Round 1) and 3.7 µg/L (Round 2). TCE was detected at 24 µg/L and 16 µg/L during Rounds 1 and 2, respectively. 1,1-DCE was detected at 17 and 20J µg/L, respectively. Cis-1,2-DCE was detected at 1.2 and 0.79J µg/L, respectively. Carbon tetrachloride was not detected in GWX-8475.

GWP-10 and GWP-11

Village of Garden City supply wells GWP-10 and GWP-11 have historically contained high levels of site-related contaminants since they were first sampled in the 1970s, although levels have shown a decreasing trend since the mid-1990s. Concentrations of site-related VOCs in GWP-10 during Round 1 and Round 2, respectively, were as follows: PCE at 270 and 230 µg/L; TCE at 170 and 220 µg/L; 1,1-DCE at 5.5 and 12 µg/L; cis-1,2-DCE at 13 and 26J µg/L; and carbon tetrachloride at 0.85 and 1.2 µg/L.

Concentrations of site-related VOCs in GWP-11 during Round 1 and Round 2, respectively, were as follows: PCE at 50 and 58 µg/L; TCE at 160 µg/L during both rounds; 1,1-DCE at 4 and 3.7 µg/L; cis-1,2-DCE at 13 and 10 µg/L, and carbon tetrachloride at 0.42J and 0.46J µg/L.

Evaluation of Groundwater Contamination

The highest levels of PCE and TCE (350 and 280 µg/L, respectively) are concentrated at SVP/GWM-4, at elevations ranging from approximately -221 to -156 feet below msl (approximately 250 to 310 feet bgs). It should be noted that the SVP-4 location was selected for monitoring because a distilling well/drain field was operated in the area during the 1980s, to dispose of cooling water contaminated with the site-related VOCs. The next highest levels occur downgradient (to the south) of SVP/GWM-4 in existing well GWX-10019, at a slightly shallower depth, and at the two Village of Garden City supply wells GWP-10 and GWP-11, approximately 150 feet deeper than the highest contaminant zone in SVP/GWM-4. These four wells comprise the core of the PCE/TCE contaminant plume.

GWP-10 and GWP-11 each have a capacity to pump approximately one million gallons per day (mgd) of groundwater from the Magothy aquifer (with the wells pumping alternately), and as a result, have a direct influence on the localized groundwater flow and corresponding contaminant plume. Pumping has created a significant cone of depression and has limited the downgradient migration of contamination. Groundwater flow and contaminant movement is downward and south from contaminant sources to supply well GWP-10. Limited contamination is observed south (downgradient) of the supply wells.

Further downgradient of the supply well(s), PCE and TCE contaminant levels in the most downgradient multi-port well (SVP/GWM-8) are seen at shallower depths than at the plume core in the source area. Two sources of VOC contamination (Pasley and Purex) are in the area south of the Roosevelt site. Given the shallower depth of contamination at the downgradient wells in the residential area, the presence of VOCs not associated with sources at the Roosevelt site, the presence of other VOC sources upgradient of these wells, and the fact that the Village of Garden City supply wells have limited the southward migration of contamination associated with the Roosevelt site, the contamination at the downgradient wells is likely to be related other sources of groundwater contamination.

Very deep groundwater contamination (TCE at 10.1 μg/L) was recently detected in one of the Village of Hempstead supply wells, located just south (downgradient) of multi-port monitoring wells SVP/GWM-6 and SVP/GWM-8. The source of this contamination is currently unknown, as several potential sources are located upgradient of the Hempstead well field.

Soil Gas Survey Results

Two types of soil gas samples were collected, soil gas screening and soil vapor analytical samples. For both types of samples, the air was purged with a vacuum pump at 0.2 liter/minute prior to collecting each sample.

Soil gas screening samples were collected from 158 locations on a 100-foot grid, in a large portion of the paved and unpaved areas of the site bordering Old Country Road and Clinton Road. Soil gas screening measurements of total VOCs were made with a ppbRae instrument at two depths at each location.

Soil vapor samples were collected in Summa canisters, from depths of 15 feet bgs at 30 locations adjacent to buildings 100 and 200 in the Garden City Plaza office complex, and at 100 Ring Road. In addition, six samples (from four different locations) were collected from Hazelhurst Park (the grassy strip along Clinton Road) where the screening survey results were elevated.

Soil Gas Screening Results

Soil gas screening results from approximately 15 feet bgs and 35 feet bgs are summarized below.

<u>15 Feet bgs</u>

Five of the samples collected at approximately 15 feet bgs had total VOC readings above 100 parts per billion per volume (ppbv): Location A0 at the corner of Old Country Road and Clinton Road (106 ppbv); location A11 in Hazelhurst Park east of Clinton Road (136 ppbv); location D17 west of Garden City Plaza Building 100 (531 ppbv); location D19 west of Garden City Plaza Building 200 (534 ppbv); and location F20 south of Garden City Plaza Building 200 (163 ppbv).

Of all the soil gas readings collected at approximately 15 feet bgs, 85 percent were at or below 10 ppbv; 8 percent were between 11 and 50 ppbv, and 4 percent were between 51 and 100 ppbv.

<u>35 Feet bgs</u>

Nine of the samples collected at approximately 35 feet bgs had total VOC readings above 100 ppbv: Locations A9, A10, and A11 in Hazelhurst Park east of Clinton Road

(245 ppbv, 233 ppbv, and 148 ppbv, respectively); location B15 west of the northwest corner of Garden City Plaza Building 100 (368 ppbv); location C20 one of the southern-most samples (112 ppbv); location D17 west of Garden City Plaza Building 100 (494 ppbv); location E14 north of the northeast corner of Garden City Plaza Building 100 (211 ppbv); location H1 southeast of the Citibank building, near the entrance road to the mall (152 ppbv); and location K0 on the eastern side of the mall entrance road (185 ppbv).

Of all the soil gas readings collected at approximately 35 feet bgs, 83 percent were at or below 10 ppbv; 9 percent were between 11 and 50 ppbv, and 2.5 percent were between 51 and 100 ppbv.

Soil Gas Analytical Results

Soil gas samples collected in canisters were compared to the soil gas screening criteria. Detections of site-related VOCs that exceeded the criteria are summarized below.

TCE detections exceeded the screening criterion of 2.2 micrograms per cubic meter ($\mu g/m^3$) in one sample near Garden City Plaza building 200 (SGRF-25 at 23 $\mu g/m^3$). Three samples collected along Hazelhurst Park (adjacent to Clinton Road) had TCE detections that exceeded the criterion (SGHP-2 at 3.9J, SGHP-3 at 12, and SGHP-4 at 3J $\mu g/m^3$). It should be noted that the contract required detection limit for TCE exceeded the screening criterion; it ranged from 5.2 to 5.8 $\mu g/m^3$. However, the laboratory reported positive detections below the contract required limit and above the instrument detection limit. For example, in sample SGRF-17, TCE was detected at 1.5 J $\mu g/m^3$.

Numerous other VOCs were detected at very low levels in the soil gas samples collected near the buildings and along Hazelhurst Park. None exceeded the screening criteria and most are associated with gasoline.

Prior to collection of the summa canister samples, VOC readings were taken with the ppbRAE. The results ranged from 0 ppbv to 3 ppbv. Three borehole locations had VOC readings out of this range: SGRF32 at 62 ppbv, SGRF27 at 451 ppbv, and SGRF30 at 151 ppbv. It should be noted that none of these three canister samples had detections of site-related VOCs.

Contaminant Fate and Transport Summary

The persistence of contaminants is determined by the rate of degradation, velocity of the groundwater, the geochemical conditions in the aquifer, and the retardation coefficient (Kd) of the individual compounds. The Kd values for the site-related VOCs show that they will have low adsorption to the materials in the aquifer. No residual sources in the unsaturated zone were identified.

The site-related VOCs are mobile and are expected to move with the groundwater, although at a slower rate. The large scale pumping at the Village of Garden City supply wells has altered the natural groundwater flow and has limited the downgradient movement of the contaminant plume. Natural attenuation via biodegradation appears to be limited, and due to the oxic conditions found in the aquifer, is not likely to sufficiently reduce contaminant levels.

Conceptual Site Model

The Conceptual Site Model (CSM) was developed to integrate the different types of information collected during the RI into a coherent generalized model of contaminant distribution and migration at the site.

Physical Setting with Respect to Groundwater Movement

The Roosevelt site is located within the Atlantic Coastal Plain Physiographic Province. The geology of the Roosevelt site includes sedimentary deposits that thicken from about 800 feet at the northern edge of the Town of Hempstead to approximately 1,500 feet thick beneath the barrier islands. Sedimentary units encountered during drilling include the Magothy Formation and glacial deposits. These two units form a single aquifer beneath the site.

At the Roosevelt site, the majority of supply wells are screened in the Magothy, which is approximately 500 feet thick and consists of interbedded sands, clayey sands, sandy clay, silts, and gravel. The Upper Glacial (water table) aquifer unconformably overlies the Magothy and consists of uniform glacial outwash deposits that are predominantly stratified sand and gravel. The water table ranges from 25 to 40 feet bgs. Groundwater flow is to the south. Horizontal flow velocities in the unconfined water table glacial aquifer are about 1.0 foot per day (ft/d). Average horizontal flow rates for the Magothy are about 0.3 ft/d.

Potential Contaminant Sources to Groundwater

From the early parts of the twentieth century until 1951, the Roosevelt Field airfield was an active facility with runways, hangars, and air craft maintenance and repair shops. Based on aerial photographs, buildings were concentrated along both Old Country Road and Clinton Road, with airplanes parked on the sides of the buildings away from the roads, near the runways. Solvents such as TCE and PCE came into use for cleaning, degreasing, and deicing in the late 1930s. Chlorinated solvents may have been used for a variety of purposes around the air field complex. At the time, the common disposal method for used and/or spent solvents was direct discharge to the ground surface. It is unknown if solvents were discharged to the ground at centralized disposal areas, or discharged at the most convenient location at any given time.

The soil gas survey indicated a few areas with elevated soil gas, but levels do not indicate the presence of residual sources in the vadoze zone. Results of groundwater sampling in multi-port wells indicate a potential residual source of groundwater contamination is present below the water table in the area where diffusion wells/drain field were used, west of Garden City Plaza Building 100.

Expected Transport and Fate of Site Contaminants

Liquid chlorinated solvents discharged directly to the ground surface would be expected to migrate downward through the unsaturated zone in a relatively linear pattern, with minimal dispersion from the discharge location. The unsaturated zone at the Roosevelt site is primarily sandy material, so complex migration pathways along lower permeability zones was unlikely to occur. The unsaturated zone is approximately 25-40 feet thick.

Once liquid chlorinated solvents (TCE and PCE) encounters the water table, some of the solvent will become dissolved in the groundwater and begin to move in the direction of groundwater flow. Contaminant levels do not indicate the presence of dense non-aqueous phase liquid (DNAPL). At the Roosevelt site, groundwater generally flows toward the south. However, the natural movement of groundwater and TCE/PCE in the saturated zone has been complicated by the extensive groundwater extraction that has occurred in the area from several types of wells. Records for Village of Garden City supply wells 10 and 11 indicate they pump up to 1 million gallons per day. The large volume of water pumped from these wells has caused a localized cone of depression in the groundwater. The large scale pumping from these wells has altered the natural groundwater flow, and has limited the downgradient movement of the contaminant plume.

In addition to the Village of Garden City supply wells, seven cooling water wells pumped groundwater from the Magothy for use in building air conditioning systems. Cooling water wells pumped variable amounts of water, with greater extraction rates during the hot summer months. These wells operated from approximately 1960 to 1985. After extracted groundwater was used in air conditioning systems, the untreated water was returned to the aquifer system via surface recharge in the Pembrook recharge basin or, after minimal treatment, to a drain field west of Buildings 100 and 200.

The discharge of contaminated water into the recharge basin and drain field continued until the mid-1980s when the cooling water wells were taken out of service; this discharge may have spread contamination within the shallow aquifer. However, the sandy nature of the recharge basin soils likely did not result in retention of VOCs within the unsaturated zone. In addition, the zone below the recharge basin has been flushed with stormwater runoff for 20 years; residual contamination from Roosevelt Field is not likely to remain in the area. The Pembrook recharge basin currently only receives surficial stormwater runoff from parking lots surrounding the mall and the office buildings. The drain field/diffusion wells near Building 100 are under the paved parking lot west of Building 100 and 200 and are not currently identifiable in the field. Significant groundwater contamination is present at SVP-4, which was located near the general area of the diffusion wells/drain field.

Chlorinated solvents (such as TCE and PCE in a dissolved phase) move with the groundwater flow, but generally at a slower rate than groundwater. If disposal of TCE and/or PCE is assumed to have begun in 1945, at an estimated flow rate of 1 ft/d for the Upper Glacial and 0.3 ft/d for the Magothy, in 55 years contaminated groundwater would have migrated about 20,000 feet or 3.5 miles in the Upper Glacial and about 6,000 feet or about one mile in the Magothy. However, pumping of Village of Garden City supply wells 10 and 11 and the air conditioning cooling wells, probably slowed the movement of contaminants by altering the natural movement of groundwater and any contaminants associated with groundwater. The two Village of

Garden City supply wells continue to pump large volumes of water and have a direct influence on the localized groundwater flow. Pumping from these wells has limited the downgradient migration of the groundwater contamination over the years.

Natural attenuation of chlorinated solvents is a documented process, with PCE and TCE breaking down through a known decay chain of compounds. Some of these daughter compounds (e.g., DCE) have been detected within the complex Roosevelt plume, although at very low levels. Natural attenuation processes may be occurring in the aquifer on a limited basis.

Risk Assessment Summary

Human Health Risk Assessment

Carcinogenic risks and noncarcinogenic hazards for exposures to contaminants in groundwater at the site that were quantitatively evaluated for potential health threats.

Future Site Workers

Risks and hazards were evaluated for incidental ingestion of groundwater. The total incremental lifetime cancer risk estimates are:

- Reasonable maximum exposure (RME) cancer risk: 2×10^{-4}
- Central tendency exposure (CTE) cancer risk: 6×10^{-5}

HIs greater than 1 indicate the potential for non-cancer hazards. The calculated HIs are:

- RME HI: 3
- CTE HI: 3

Future Residents

Risks and hazards were evaluated for incidental ingestion, inhalation and dermal contact with contaminated groundwater. The total incremental lifetime cancer risk estimates are:

- Adult: RME cancer risk: 2×10^{-3} and CTE cancer risk: 3×10^{-4}
- Child: RME cancer risk: 6×10^{-3} and CTE cancer risk: 8×10^{-4}

HIs greater than 1 indicate the potential for non-cancer hazards. The calculated HIs are:

- Adult: RME HI: 10 and CTE HI: 6
- Child: RME HI: 35 and CTE HI: 10

Screening Level Ecological Risk Assessment

The initial activities associated with a Screening Level Ecological Risk Assessment (SLERA), as described in ERAGs (1997), were completed for this investigation. These activities included the following:

- Obtaining information regarding the environmental setting and chemical contamination;
- Collecting additional information related to the ecological resources at the site through consultation with United States Fish and Wildlife Service (USFWS) and the New York State Department of Environmental Conservation (NYSDEC) regarding threatened and endangered species;
- Utilizing USGS topographical maps and aerial photographs; and
- Performing a site visit to obtain detailed information relating to the habitat types present at the site and to identify the flora and fauna at the site.

VOCs in the groundwater are the primary contaminants and groundwater is the primary medium of concern for the site. Given that groundwater does not discharge to a surface water body, which prevents exposure to any potential ecological receptor at the site, a conclusion can be reached that there are no completed pathways present at the site for ecological receptors. In addition, the RI investigation also concluded that the source areas are not longer present at the site, which prevents any potential exposure to contaminated soil for ecological receptors. Based on this information, there is adequate information to conclude that ecological risks are negligible and therefore there is no need for remediation on the basis of ecological risk.

Conclusions

Groundwater Conclusions

Based on data collected during RI hydrogeological investigation, the following conclusions regarding groundwater contamination at the Roosevelt Field site are presented.

- The main VOCs associated with the Roosevelt site groundwater contamination are: PCE, TCE, 1,1-DCE, cis-1,2-DCE, and carbon tetrachloride.

- The TCE/PCE contaminant plume has migrated south from the area used as an airfield prior to 1951. The natural southerly flow of groundwater has been interrupted by large scale pumping at the two municipal supply wells of the mall complex. These supply wells have, in effect, limited the migration of the plume and prevented migration further south.

- At the SVP/GWM-4 area, the core of the plume is located at approximately 250 to 310 feet bgs. This area was formerly used as a drain field/distilling well for subsurface disposal of cooling water that was contaminated with the site-related VOCs.

- South of the two Village of Garden City supply wells, VOC contamination is shallower, and is likely to be related to two contaminant sources (Pasley and Purex) south of the Roosevelt Field site.

- The RI has sufficiently determined the nature and extent of groundwater contamination at the site, and enough data exist to proceed with the FS.

Soil Gas Conclusions

Based on data collected during the RI source area soil gas investigation, the following conclusions regarding soil gas at the Roosevelt Field site are presented.

- One small soil gas hot spot was noted from soil gas samples analyzed via method TO-15 in an area of Hazelhurst Park, along Clinton Road, west of the office building at 100 Ring Road. EPA evaluated this hot spot with both additional vapor samples on the west side of Clinton Road and with soil samples analyzed for VOCs. The results of these additional samples can be found in a separate report in the administrative record.

- Most detected VOC compounds are associated with gasoline and are not the site-related VOCs.

The best location to compare detections in groundwater and soil gas canister samples in or near Hazelhurst Park is at existing well 9953 (screened at 35-40 feet bgs) and SVP-4 port 10 (at 45-50 feet bgs).

A very limited number of VOCs were detected at very low levels in the groundwater, including PCE, TCE, cis-1,2-DCE, acetone, methyl-tert butyl ether (MTBE), methylene chloride, and dibromochloromethane.

Numerous VOCs were detected in the soil gas analytical samples collected in Hazelhurst Park: PCE, TCE, cis-1,2-DCE, ethanol, isopropyl alcohol, 1,3 butadiene, carbon disulfide, 1,1,2-trichloro-1,2,2-trifluoroethane, acetone, methylene chloride, hexane, 1,1-dichloroethane, 2-butanone, chloroform, 1,1,1-trichloroethane, cyclohexane, 2,2,4-trimethylpentane, benzene, n-heptane, toluene, ethylbenzene, m-xylene, o-xylene, and 1,2,4-trimethylbenzene.

Three VOCs were detected in both the groundwater at the top of the water table and the soil gas samples in Hazelhurst Park: PCE, TCE, and cis-1,2-DCE. The majority of VOC compounds detected in the soil gas samples are related to gasoline and are, therefore, considered non-site related. The source of the chlorinated VOCs (e.g., TCE, PCE, and cis-1,2-DCE) in the soil gas is unknown. A review of historical aerial photos from the 1930s and 1940s indicates that the location of Clinton Road has not changed over the years. The airfield buildings faced the street, with lawns and occasional shrubs fronting the buildings on the street side. There is no evidence of airplane use in the area that is now Hazelhurst Park. All airplanes were parked (and presumably maintained) on the sides of the buildings that faced away from the street, closer to the runways. It is highly unlikely spent solvents were disposed of in the landscaped areas in the front of the buildings along Clinton Road.

1 Section One

Section 1 Introduction

CDM Federal Programs Corporation (CDM) received Work Assignment 146-RICO-02PE under the Response Action Contract (RAC) to perform a remedial investigation/ feasibility study (RI/FS), and a human health risk assessment (HHRA) at the Old Roosevelt Field Contaminated Groundwater Site (the Roosevelt site), located in Garden City, Nassau County, New York, for the Environmental Protection Agency (EPA). This RI report was prepared in accordance with Subtask 9.1 of the CDM Final Work Plan, dated December 10, 2004 (CDM 2004). The purpose of this work assignment is to investigate the nature and extent of contamination at the site.

EPA Region 2, the lead agency for the response actions at the site, directed CDM to complete the RI in accordance with EPA regulations and guidance to ensure its compliance with EPA protocols and procedures. As such, the Final RI Report reflects that direction.

EPA, as the lead agency for the response actions, followed the Code of Federal Regulations, 40CFR300 (the National Contingency Plan or NCP),which provides direction on the execution of field activities and the preparation of RI reports for Superfund sites.

In conducting the RI at Superfund sites, two key sections from the NCP are worth noting, specifically:

- 40 CFR 300.430 (a)(2): The purpose of the RI/FS is to assess site conditions and evaluate alternatives to the extent necessary to select a remedy.
- 40 CFR 300.430 (d)(1): The purpose of the RI is to collect data necessary to adequately characterize the site for the purposes of developing and evaluating effective remedial alternatives.

It is important to note that since the field investigation was conducted in accordance with EPA regulations, guidance and standards, the resultant data were found to be of high quality, fully defensible, and provide an accurate assessment of site conditions. Additionally, all data quality objectives developed during the ongoing project planning efforts, were met and adequately satisfied. The findings of CDM's RI and HHRA will allow EPA Region 2 to develop and evaluate effective remedial alternatives.

1.1 Purpose of Report

The purpose of the RI Report is to present the results of the hydrogeologic and source area soil gas investigations, which included groundwater screening, multi-port well installation, downhole geophysical logging, groundwater sampling, soil gas screening, and soil gas sampling. The HHRA will be submitted under separate cover and is summarized in Section 6. The hydrogeologic and source area soil gas investigations were conducted to determine the nature and extent of site-related contamination.

Groundwater and soil gas samples were collected and analyzed; results of these analyses are compared with EPA-approved screening criteria, where available.

1.2 Site Description

The Old Roosevelt site is an area of groundwater contamination within the Village of Garden City, in central Nassau County, New York. Figures 1-1 and 1-2 provide a site location and a site map, respectively. The site is located on the eastern side of Clinton Road, south of the intersection with Old Country Road; it includes the area of the former Roosevelt Field airfield. The former Roosevelt Field airfield site area is currently developed as a large retail shopping mall with a number of restaurants, and a movie theater. A thin strip of open space along Clinton Road (known as Hazelhurst Park) serves as designated parkland and a buffer with the residential community. Several office buildings (including Garden City Plaza) are on the western perimeter of the mall and share parking space with the mall. Two recharge basins are directly east and south of the mall area. The eastern basin, Pembrook, is on property owned by the mall. The basin to the south is Nassau County Storm Water Basin number 124.

Two municipal supply well fields are located south (downgradient) of the site. The Village of Garden City public supply wells (designated as wells 10 and 11) are located just south of the site boundary, on the eastern side of Clinton Road. The Hempstead well field is located approximately 1.5 mile south of the Garden City supply wells.

1.3 Site History

The history of the Roosevelt site is summarized from the HRS package prepared by Roy F. Weston (2000).

The Roosevelt site was used for aviation activities from 1911 to 1951. The original airfield was known as the Hempstead Plains Aerodrome and encompassed 900 to 1,000 acres east of Clinton Road and south of Old Country Road. By the time the field opened in July 1912, there were 5 cement and 30 wooden hangars along Old Country Road, 4 grandstands along Clinton Road, and several flying schools. At least two aviators built aircraft at the field in 1912, including the first all-metal monoplane in America. During its first three years, activities at the airfield included civilian flight training, equipment testing, and aerial stunt shows.

The United States (U. S.) military began using the Hempstead Plains field prior to World War I. The New York National Guard First Aero Company began training at the airfield in 1915, and in 1916 the U.S. Army used the field to train Army and Navy officers. When the U. S. entered the war in April 1917, the airfield was taken over as a training center for military pilots and renamed Hazelhurst Field. The Army removed the grandstands, built barracks along Clinton Road, and built larger hangars along Old Country Road. In 1918, the Army changed the name of the airfield to Roosevelt Field in honor of Quentin Roosevelt, a son of Theodore Roosevelt who had trained there and was killed during the war. Roosevelt Field was used throughout the war to train aviators.

After the war, the U. S. Air Service authorized aviation-related companies to operate from Roosevelt Field, but maintained control until July 1, 1920, at which time the Government sold its buildings and relinquished control of the field. Subsequently, the property owners sold portions along the southern edge of the field and split the remainder of the property into two flying fields with an incline between them. The eastern half, with sod runways and only two hangars, continued as Roosevelt Field. The western half, which had many hangars, flying schools, and aviation maintenance shops, became known as Curtiss Field.

By 1929, the eastern field (Roosevelt) had served as the starting point or terminus of many notable flights, including Lindbergh's takeoff for his historic trans-Atlantic flight in May 1927. The western field (Curtiss) was used for flying circuses, a flying school, aircraft sales and service, and flight tests. Both fields were bought in 1929 by Roosevelt Field, Inc., and the property was once again called Roosevelt Field. Improvements were quickly made, including the installation of several large steel and concrete buildings for hangars, shops, and office space along Old Country Road. As of November 1929, numerous aviation-related businesses operated in the hangars and other buildings surrounding the western field. By 1932, paved runways and 50 buildings made Roosevelt Field the country's largest and busiest civil airfield. While the western field developed into the large aviation center that continued to operate throughout the 1930s, the eastern field remained unpaved, with few buildings, until it was leased in 1935 and became a racetrack.

Roosevelt Field was used by the Navy and Army during World War II. In July 1939, the Army Air Corps contracted Roosevelt Field, Inc. to provide airplane and engine mechanics training to Army personnel at their school. In early 1941, there were more than 200 Army students and approximately 600 other students at the Roosevelt Aviation School. At the beginning of 1942, after the U.S. had entered the war, civilian flying and private hangar rental had ceased at Roosevelt Field due to a ban on private flying in defense areas.

As of March 1942, there were 6 steel/concrete hangars, 14 wooden hangars, and several other buildings at Roosevelt Field. The Army training school was concentrated in the buildings located along Clinton Road. In addition to the training activities, the Roosevelt Field facilities were used to receive, refuel, crate, and ship Army aircraft.

The Navy also used Roosevelt Field during World War II. In November 1942, the Navy Bureau of Aeronautics established a modification center at Roosevelt Field to install British equipment into U.S. aircraft for the British Royal Navy. The Navy leased five steel/concrete hangars along Old Country Road; built a barracks, mess hall, and sick bay; commissioned U.S. Naval Air Facility (NAF) Roosevelt Field by February 1943. By September 1943, the Navy had built wooden buildings between four of the hangars, and in October 1943 leased six additional hangars. NAF Roosevelt Field was responsible for aircraft repair and maintenance, equipment installation, preparation and flight delivery of lend-lease aircraft, and metal work required for the installation of British modifications. The metal work constituted a substantial portion of the facility's work load. The facility also performed salvage work of crashed Royal Navy planes. The Navy vacated all but six hangars shortly after the war ended, and removed their temporary buildings by the time their lease expired on June 30, 1946. Restoration of buildings and grounds was completed by August 1946, and Roosevelt Field operated as a commercial airport until it closed in May 1951.

Soon after the airfield closed construction began at Roosevelt Field and further development was planned. The large Roosevelt Field Shopping Center was constructed at the site and opened in 1957. The old field is currently the site of the shopping mall and office building complexes and is surrounded by commercial areas and light industry. Three of the old Navy hangars remained standing until some time after June 1971, with various occupants, including a moving/storage firm, discotheque, amusement center, and bus garage.

It is possible that chlorinated solvents were used at Roosevelt Field during and after World War II. Chlorinated solvents such as tetrachloroethene (PCE) and trichloroethene (TCE) have been widely used for aircraft manufacturing, maintenance, and repair operations since about the 1930s. Beginning in the late 1930s, the U.S. military issued protocols for use of solvents such as TCE for cleaning airplane parts and for de-icing. The types of airplanes designated for solvent use were present at Roosevelt Field during World War II. The finished specifications for at least one type of plane that the Navy modified at Roosevelt (eight of which were on site in April 1943) calls for aluminum alloy to be cleaned with TCE. An aircraft engine overhaul manual issued in January 1945 specified TCE as a degreasing agent. It is therefore highly likely that chlorinated solvents were used and subsequently disposed at the site. No specific disposal areas have been identified.

Wells 10 and 11 were installed by the Village of Garden City in 1952 and were put into service in 1953. Well 10 is screened from 377 to 417 feet below the ground surface (bgs) and well 11 is screened from 370 to 410 feet bgs. Both wells had shown the presence of PCE and TCE since they were first sampled in the late 1970s and early 1980s, and concentrations increased significantly until 1987, when an air-stripping treatment system was installed at the site. Sampling results of treated well water from May 1993, September 1995, and June/July 1999 indicated that breakthrough of the treatment system had occurred. As shown in Table 1-1, the highest levels of volatile organic compound (VOC) contamination were noted during the mid-to late 1990s, and have steadily declined since then. Cooling water well N8050, located adjacent to the office building at 100 Ring Road, contained the highest levels of VOCs during the 1980s; these results are also included on Table 1-1.

1.4 Previous Investigations

Several investigations of groundwater contamination in the vicinity of Old Roosevelt Field have been conducted. The primary results are summarized below. In addition to these previous investigations, Appendix A includes an inventory of existing wells and previous groundwater sampling results.

Roosevelt Field Groundwater Contamination Study - Nassau County Department of Health (NCDH) The results of this study indicated that the pumping from the Magothy aquifer by non-contact cooling water wells in the mall area and discharge of the spent cooling water to Pembroke Basin were significantly affecting seasonal water table elevations. Vertical flow was occurring between the water table aquifer and the underlying principal municipal water aquifer at Roosevelt Field. The highest concentrations of VOCs in the water table aquifer were detected south (and downgradient) from the recharge basin, and attributed to discharge of contaminated cooling water to the recharge basin. Total VOC concentrations were up to 1,115 parts per billion (ppb), chiefly composed of TCE and PCE. A cone of depression around the Village of Garden City supply wells appeared to have a strong influence on the movement of contaminants in the vicinity of downgradient monitoring wells. The highest contamination detected in deep wells at Roosevelt Field was found in cooling water well N8050 (40,890 ppb total VOCs) located near the northwest corner of the shopping center. Other deep wells sampled 1,000 feet north of N8050 (N6045) and 500 feet to the west (N5485 and N8458) showed much lower concentrations, suggesting that the source of the contamination was derived near well N8050. Deep well samples on the southern portion of the site contained significant concentrations of carbon tetrachloride, whereas the most contaminated deep wells on the northern portion of the mall (e.g., N8050) did not contain more than trace concentrations of carbon tetrachloride. The study concluded that these differences in concentrations and composition of VOC contaminants may be attributed to more than one source or that the same source discharged different contaminants over time. (Geraghty & Miller 1986).

Environmental Assessment Report - Subsurface Investigation for Soil Contamination for the Proposed Clinton Road/Stewart Avenue Bypass at Roosevelt Field - Nassau County Department of Public Works (NCDPW). Eighteen shallow and 11 deep borings were installed in the western section of the site to provide an assessment of the potential impact from excavation of contaminated soil during construction of a new road. None of the samples collected from the 29 soil borings had detections of the contaminants of concern. (Camp, Dresser and McKee 1987)

United States Geological Survey (USGS) Water Resources Investigation 86-4333. From March 1982 through September 1984, the USGS, NCDH, and NCDPW completed a cooperative study to evaluate the occurrence and movement of VOCs in the groundwater at Roosevelt Field. A well network consisted of 52 monitoring wells, 28 public supply wells and 25 cooling water wells were sampled in a 10 square mile area. To supplement the investigation, seven additional shallow and two deep Magothy Aquifer wells were installed. The USGS identified three separate plumes of chlorinated VOCs, specifically TCE, emanating from the Roosevelt Field area, with the plumes extending south into a residential portion of Garden City. Figure 1-3 illustrates the TCE plumes from this investigation. (USGS 1989).

Field Report Summary, New York Superfund Standby Contract, Garden City Schools Field Investigation. Following concerns that organic solvents in groundwater may be impacting area schools through release of soil vapor to the vadose zone, in 1993 the

New York State Department of Environmental Conservation (NYSDEC) ordered soil vapor samples to be collected from the Stewart School located approximately 3,000 feet southwest and hydraulically downgradient from Roosevelt Field. Five soil vapor samples were collected from 10 feet below grade around the perimeter of the Stewart School (5-10 feet from the building). Groundwater samples also were collected at each soil gas sampling location and submitted for laboratory analysis. The samples were analyzed for VOCs and chlorinated VOCs. Laboratory results for the samples collected at Stewart School indicated neither VOCs nor chlorinated VOCs were detected in groundwater or soil vapor. (H2M Group 1993).

1.5 Current Site Conditions

The site currently consists of a large shopping mall, numerous restaurants, a movie theater, and office buildings which ring the shopping mall. Most of the open space at the site is asphalt parking areas for the shopping mall and office buildings. The southern portion of the site contains the two Village of Garden City supply wells, two recharge basins and a small strip of open space just east of Clinton Road. The two Village of Garden City supply wells each have a capacity to pump approximately one million gallons per day (mgd), with the wells pumped alternately. All groundwater from the two wells is treated on-site by dedicated air strippers. All of the cooling water wells have either been abandoned or taken out of service.

Very deep groundwater contamination (TCE at 10.1 ug/L) was recently detected in one of the supply wells at the Village of Hempstead well field. The source of this contamination is currently unknown as several potential sources are located upgradient of this area.

1.6 Report Organization

The RI report organization is described below. The tables and figures are presented at the end of the report.

Executive Summary	Provides a synopsis of the investigations conducted and their results.
Section 1	Introduction - presents the regulatory framework for performing the RI and summarizes the objectives of the RI. It provides an overview of the site, including summaries of previous investigations.
Section 2	Study Area Investigations - describes the methodology and sampling rationale for the investigations conducted for the RI.
Section 3	Physical Characteristics of the Study Area - describes the physical attributes of the study area, including surface topography, surface water hydrology, geology, and hydrogeology and meteorology. Sections on demography, land use, and ecology are included.
Section 4	Nature and Extent of Contamination - lists groundwater screening criteria and/or standards against which site data were screened to determine the extent of contamination. The

	type and extent of groundwater and soil gas contamination at the site are described.
Section 5	Contaminant Fate and Transport - evaluates the persistence and mobility in the environment of the site-related contaminants and summarizes the fate and transport mechanisms that apply to the site.
Section 6	Risk Assessment Summary - The HHRA identifies receptors, chemical of potential concern (COPCs), exposure pathways, and exposure assumptions used to characterize the potential human health risks associated with groundwater at the site. The HHRA will be submitted as a separate document.
Section 7	Conclusions - presents the conclusions of the RI.
Section 8	References

Section Two

Section 2
Study Area Investigations

The RI field activities included a hydrogeological investigation and a source area soil gas investigation. The work, except where noted, was performed in accordance with the following documents prepared by CDM:

- Final Work Plan, Old Roosevelt Field Contaminated Groundwater Site, Remedial Investigation/Feasibility Study, Garden City, New York, dated December 10, 2004.

- Final Quality Assurance Project Plan (QAPP), Old Roosevelt Field Contaminated Groundwater Site, Remedial Investigation/Feasibility Study, Garden City, New York, dated February 9, 2005.

- Final QAPP Addendum - Source Area Soil Gas Survey, Old Roosevelt Field Contaminated Groundwater Site, Remedial Investigation/Feasibility Study, Garden City, New York, dated October 12, 2005.

Activities performed during these investigations are described in this section, as listed below:

<u>Hydrogeological Investigation</u>

- Conducted a geophysical survey to locate underground utilities
- Collected discrete-depth groundwater screening samples for 24-hour turnaround VOC analysis to assist in selection of multi-port well screen intervals
- Conducted natural gamma logging in multi-port wells
- Installed and developed 4-inch diameter outer screen and casing assemblies to support installation of the multi-port monitoring well equipment
- Installed multi-port monitoring well equipment
- Collected two rounds of hydrostatic pressure measurements (multi-port wells) and synoptic water level measurements (existing wells)
- Re-developed select existing monitoring wells
- Collected two rounds of groundwater samples from multi-port monitoring wells, select existing monitoring wells, and the two Village of Garden City supply wells

<u>Source Area Soil Gas Investigation</u>

- Conducted a geophysical survey to locate underground utilities
- Installed temporary soil gas points and conducted soil gas screening in the source area
- Collected soil gas samples adjacent to three office buildings and in Hazelhurst Park

<u>Ecological Investigation</u>

- Conducted an ecological survey

<u>Cultural Resources Survey</u>

- Conducted a Stage 1 Cultural Resources Survey

The RI field investigation was designed to characterize the nature and extent of contamination in the groundwater and in soil gas. A summary and schedule of these activities is presented in Table 2-1.

Except where noted, RI field investigation activities were conducted in accordance with the EPA-approved QAPP and QAPP Addendum. During the field investigation, deviations from the QAPP and Addendum were documented on field change request (FCR) forms, which are presented in Appendix B. The forms describe deviations to the QAPP, the reason for the deviation, and the recommended modification. The deviations were discussed with the EPA remedial project manager, and were agreed upon by the CDM site manager, task manager, and the field team leader. None of the changes affected the project objectives or the representativeness, completeness, precision, or accuracy of the data collected in the field. The FCRs are discussed in the following sections, as appropriate.

2.1 Groundwater Investigation

The groundwater investigation included a surface geophysical survey, a multi-port monitoring well installation program, an existing well assessment., and groundwater sampling at the multi-port wells, existing wells, and Village of Garden City supply wells.

Figure 2-1a shows the locations of all multi-port wells, existing monitoring wells, and Village of Garden City supply wells included in the hydrogeological investigation. The location of the Hempstead Well Field in relation to the multi-port wells is shown on Figure 2-1b.

2.1.1 Geophysical Utility Survey

Prior to drilling activities, CDM's geophysical subcontractor, Naeva Geophysics, Inc., conducted a geophysical utility survey at each proposed multi-port well location. The purpose of the survey was to identify any potential underground utilities or objects that would prohibit drilling at the location. Four instruments were used to conduct the survey: a Fisher TW-6 M-scope pipe and cable locator; a Subsite 950 utility locator; a 3M Dynatel 2250 cable locator; and a NOGGIN 250 ground penetrating radar (GPR) system with a 250 megahurtz (MHZ) antenna. Final well locations were adjusted based on readings from these instruments, and are shown on Figure 2-1a. The geophysical utility survey report is presented in Appendix C.

2.1.2 Multi-Port Monitoring Well Program

The multi-port monitoring well program included groundwater screening, downhole gamma logging, outer well casing and screen assembly installation, and multi-port well installation.

2.1.2.1 Drilling and Groundwater Screening Survey
Eight screening vertical profile (SVP) borings were advanced using hollow stem auger (HSA) and geoprobe drilling methods. Total borehole depths ranged from 400 to 450 bgs. Groundwater screening samples were collected at 20-foot intervals, starting at the bottom of the borehole (which ranged from 400 to 450 feet bgs) to the water table (which ranged from 27 to 37 feet bgs). The drilling methods were changed from mud rotary drilling outlined in the QAPP; this change was documented in FCR No.1. The HSA and geoprobe methods were used to increase sample quality by ensuring that the groundwater screening samples did not contain drilling mud.

Three and three-quarter inch inner diameter (ID) HSAs were advanced to just above the sample interval. Two-inch diameter geoprobe rods and a screened probe were advanced to the sample interval. All groundwater screening samples were collected using low-flow sampling techniques with a ¾-inch diameter bladder pump and decontaminated teflon-lined tubing. Water quality parameters such as pH, conductivity, dissolved oxygen (DO), and turbidity were recorded prior to sample collection. Water quality readings are presented in Appendix D. The samples were analyzed for Target Compound List (TCL) VOCs with 24-hour turn around time, by EPA's mobile laboratory; a secondary laboratory subcontracted to CDM, GPL Laboratories, Inc., provided backup analyses when EPA's mobile laboratory was not available.

Groundwater screening results were used to determine the vertical groundwater contamination profile for use in selecting appropriate depths for the multi-port well sampling ports.

Table 2-2 lists the groundwater screening samples collected. Groundwater screening results are discussed in Section 4.3.1.1 of this report.

2.1.2.2 Borehole Natural Gamma Logging
Natural gamma logging was conducted at each SVP borehole to locate clays and lower permeability zones that could affect contaminant transport. Natural gamma logs were completed using a Slim Gamma Probe and reel. Two gamma logs were run for each borehole; one from the top down, and one from the bottom up. Gamma logs are discussed in Section 3.3.2.1. The results are presented in Appendix E.

2.1.2.3 Outer Screen and Casing Installation and Development
Once the multi-port well intervals were determined from the groundwater screening results, an outer screen and casing assembly was installed at each SVP location. Groundwater screening boreholes were re-drilled using mud rotary drilling methods, using an 8-inch nominal diameter tri-cone roller bit.

After the target depth was reached, the outer screen and casing assembly was installed. The assembly consisted of 4-inch diameter stainless steel casing and 5-foot lengths of 0.010-slot wire-wrapped screen at pre-selected intervals. The assembly served as an outer support in which the Westbay multi-port well ports were installed.

Table 2-3 summarizes the depths of the outer screen intervals and multi-port well equipment.

After the entire outer screen and casing assembly was installed, the annulus was backfilled with No. 1 sand and cement-bentonite grout. No. 1 sand was placed in the annulus surrounding each screen interval, two to five feet below and above each interval. The remaining annulus between the sand pack were backfilled with bentonite slurry, consisting of a one to one mixture of granular bentonite and No. 3 sand, as described in FCR No.3. For each annular seal interval, the required volume of slurry was calculated prior to emplacement with a tremie pipe and gravel feed pump.

Following the outer screen and casing assembly installation, the first stage of well development was conducted in order to ensure the following:

- Drilling mud was removed from the aquifer surrounding the well
- Fine-grained sediment was removed from screen intervals
- Settling of the sand pack around each screen
- Good hydraulic connection between the screen and the aquifer materials

Each screen interval was developed by isolating the interval with packers and using the pump and surge method with a 4-inch diameter submersible pump. During the first stage of development, water quality parameters were collected and recorded on development sheets for DO, oxidation-reduction potential (Eh), turbidity, pH, temperature, conductivity, and salinity. Development continued until water quality measurements stabilized to within 10 percent and the water was relatively clear. Turbidity measurements at the conclusion of the first stage of development ranged from 0 to 64 nephelometric turbidity units (NTU). The second stage of development occurred after the installation of the Westbay multi-port system, and is discussed in Section 2.1.1.4.

The water generated during development was transported to the project support location and transferred to 20,000 gallon holding tanks prior to sampling and disposal.

2.1.2.4 Multi-Port Monitoring Well Installation

After the installation of the outer screens and casings, a Westbay multi-port well system was installed inside each outer screen and casing assembly. Each Westbay multi-port system was assembled *ex-situ* and included the following components and uses:

- Multi-port Packers - installed between sampling and measurement ports; seals against the outer casing assembly, preventing vertical flow.

- Multi-port Measurement Ports - installed adjacent to outer screen intervals; permits water sampling and fluid pressure measurements; also may be used to test packer seal integrity of multi-port packers.

- Multi-port Pumping Ports - installed adjacent to outer screen intervals; permits purging, hydraulic conductivity testing, and quality control (QC) testing.

Table 2-3 summarizes the depths of each of the well components. Multi-port well completion forms are included in Appendix E.

After the Westbay multi-port monitoring well was installed, each sampling port was initially purged prior to sampling. The purpose of this purge was to ensure that the groundwater within the packer interval was representative of the water quality in the aquifer. During installation of the multi-port system, the water present within the 4-inch well casing was confined by the multi-port packers located at the top and the bottom of each of the well's screened intervals. This water was purged to allow fresh formation water to enter the well for subsequent sampling. The volume of water to be purged was calculated for each port by totaling the volume of static water above the desired port inside the casing.

An open/close tool, provided by Westbay, was used to open the desired port and allow the water to flow into the well. A hose with a ball check valve was then lowered down the inner Westbay well equipment to purge the water. After the correct volume of water was purged, the open/close tool was used to close the port. This process was completed for each port of each multi-port well.

The open/close tool became stuck while attempting to open port 2 at SVP-8. Westbay personnel were able to retrieve the tool without damaging the well, and the data were not affected.

The location and elevation of all multi-port monitoring wells were determined by CDM's surveying subcontractor, Geod, Inc. Measurements of ground surface, top of inner casing, and top of outer casing were made to an accuracy of a hundredths of a foot. The locations of the multi-port monitoring wells are shown on Figure 2-1a.

2.1.2.5 Multi-Port Monitoring Well Sampling

Two rounds of groundwater samples were collected from the eight multi-port monitoring wells. Round 1 occurred from March 23, 2006 to April 14, 2006 and Round 2 occurred from July 10 through July 20, 2006. Multi-port well samples are listed in Tables 2-4a and 2-4b. These samples are noted by the GWM prefix.

Prior to sampling the multi-port wells, pressure readings were recorded at the measurement port of each sample location, along with atmospheric pressure readings. The pressure readings were used to calculate the depth to water and water level elevations for each well port. Water level elevations are presented in Section 3.4.2.

All multi-port monitoring well samples were collected using Westbay sampling equipment, which included a tripod with a manual reel, an electronic sampling probe with interface unit that monitored and controlled pressure, a manual vacuum pump, and a series of four 250 milliliter (mL) stainless steel samplers to collect water samples. Prior to lowering the sampling probe with the stainless steel samplers, a manual vacuum pump was used to create a vacuum in the samplers. Once the probe and tubes were lowered to the appropriate port, an air tight seal was created between the port and the sampling probe, and a correct water pressure reading was verified. This air tight seal and the vacuum forced water from the port to fill the 250 mL stainless steel samplers for sample collection. A pre-printed form supplied by Westbay was completed by CDM personnel to ensure the correct procedure was followed. Water quality parameters were collected and recorded on groundwater sampling forms, including conductivity, Eh, turbidity, pH, temperature, and DO. The completed forms are included in Appendix F. All equipment was properly decontaminated between each port to prevent cross contamination.

The multi-port well samples were analyzed for low detection limit (LDL) VOCs. In addition, one port from each well was sampled and analyzed for additional parameters, as detailed on Tables 2-4a and 2-4b. Eight multi-port wells were sampled, from a total of 64 ports. One exception was that SVP-1 port 1 was not sampled during Round 1 because the port was not able to be opened. The results of the multi-port monitoring well sampling are presented in Section 4.3.1.2.

2.1.3 Existing Monitoring Wells

CDM assessed the condition of select existing monitoring wells in the areas around Garden City Plaza and downgradient areas, for sample collection. Wells were selected based on location and screen depth, to help define the nature and extent of VOC contamination. The well assessment included measurement of well diameter and depth, assessment of whether the well would accommodate a 2-inch diameter submersible pump, well security (i.e., functioning security locks), and observations of any damage to the well. The following nine existing Nassau County monitoring wells were selected for inclusion in the two groundwater sampling rounds: GWX-10019, GWX-9398, GWX-10020, GWX-9953, GWX-9966, GWX-10035, GWX-8068, GWX-8475, and GWX-8474. GWX-1451 was selected but found to be dry, and therefore was not sampled. Construction details for these wells are summarized in Table 2-5. The locations of the sampled wells are shown on Figure 2-1a.

2.1.3.1 Existing Monitoring Well Redevelopment

Three of the existing wells were not developed because they contained pumps and associated piping. The remaining six existing wells were redeveloped by pump and surge techniques, using a 2-inch diameter submersible Grundfos pump. Redevelopment continued until water quality parameters had stabilized to within 10 percent and the water was relatively free of sediment. Existing well development forms are presented in Appendix G.

The location and elevation of existing wells were determined by CDM's surveying subcontractor, Geod, Inc. The elevation was measured to an accuracy of a hundredths of a foot.

2.1.3.2 Existing Monitoring Well Sampling

Two rounds of samples were collected from existing monitoring wells to delineate the vertical and lateral extent of groundwater contamination. Samples were collected in conjunction with the two rounds of multi-port monitoring well samples. Groundwater samples were collected from the nine selected existing monitoring wells. Well GWX-8068 was only sampled during Round 2 because it was not accessible during Round 1.

Prior to each sampling round, CDM collected a round of synoptic water levels from the existing monitoring wells to calculate water level elevations; water level elevations are presented in Section 3.4.2.

Monitoring wells were purged and sampled using a two-inch diameter submersible Grundfos pump with dedicated ¾-inch Teflon™-lined polyethylene tubing, following the site-specific, low-flow, minimum drawdown sampling procedure stated in the Final QAPP. Water quality parameters such as DO, oxidation reduction potential (ORP), turbidity, pH, temperature, and conductivity measurements were collected at three- to five-minute intervals during the low-flow well purging activity until parameter stabilization was achieved as specified in the Final QAPP. Existing monitoring well samples and analyses for Rounds 1 and 2 are summarized in Tables 2-4a and 2-4b. Low-flow groundwater sampling sheets are included in Appendix H.

The existing monitoring well and Village of Garden City supply well locations are identified on figures and tables by the prefixes "GWX" and "GWP", respectively. Twenty-one groundwater samples (2 rounds) were collected (excluding duplicates or QC samples). The samples were analyzed for the parameters indicated on Tables 2-4a and 2-4b.

Results from the existing monitoring well samples are discussed in Section 4.3.1.3.

2.1.4 Supply Well Sampling

CDM collected two rounds of groundwater samples from Village of Garden City supply wells 10 and 11. The Village of Garden City supply wells samples were assigned sample identification numbers GWP-10 and GWP-11. Construction details for the Village of Garden City supply wellss are detailed in Table 4-5. The Village of Garden City supply wells samples were collected concurrently with the two rounds of multiport and existing monitoring wells. The water from these wells is currently treated with air strippers to remove VOC contamination. Samples were collected from taps located in the pump houses, prior to treatment.

Samples were analyzed for the same parameters as the existing monitoring well samples, as shown in Tables 2-4a and 2-4b. Groundwater quality parameters DO, Eh, pH, temperature, conductivity, and turbidity were measured in the field. These measurements were recorded on Low-Flow Sampling Forms, and are presented in Appendix H. Village of Garden City supply wells sampling results are discussed in Section 4.3.1.3.

Water levels were not collected from the Village of Garden City supply wellss because they were inaccessible for water level measurement equipment.

2.2 Source Area Soil Gas Investigation

The objective of the source investigation was to determine whether residual sources of VOCs were present in the unsaturated zone in the areas where airfield buildings and airplane parking were located along Clinton Road and Old Country Road. Residual VOCs may act as a continuing source of groundwater contamination. Prior to the soil gas work, a geophysical survey was conducted to location underground utilities, as described in Section 2.2.1. Two types of soil gas samples were collected. The soil gas screening survey is described in Section 2.2.2 and the soil gas canister sampling is described in Section 2.2.3.

2.2.1 Geophysical Utility Survey

The ARM Group, Inc. (ARM), under subcontract to CDM, performed a geophysical investigation to locate underground utilities in the soil grid area from December 7 to December 13, 2005. The objective of the survey was to identify buried objects such as electrical conduits and water or gas pipes that would impede the installation of soil gas probes.

Prior to the geophysical utility survey, the locations for the soil gas screening survey and the outdoor building boring soil gas samples were determined. The soil gas screening survey locations were arranged in a grid with 100-foot nodes. The soil gas sample location adjacent to three buildings were also marked out for utility clearance. The final locations were adjusted based on results of the geophysical survey.

The geophysical investigation was conducted using a Terrasirch model SIR3000 GPR, a Metrotech 9860XT 50/60 hertz locator, and a Schonstedt model GA-72cd magnetic detector. The geophysical survey detected major power lines and conduits around most of the buildings within the grid and along Clinton Road. At the northeast section of the grid, an underground parking garage was encountered and a geophysical survey at those locations was not feasible. Based on recommendations by ARM, minor location modifications were made to ensure the safety of the field crew during the soil gas program. A global positioning system (GPS) unit model Trimble TSCI was used to measure the final locations for the soil gas survey. The final soil gas screening and sampling locations are shown in Figure 2-2a and 2-2b.

The complete Geophysical Utility Investigation report prepared by ARM is included in Appendix C.

2.2.2 Soil Gas Screening Survey

A total of 158 boreholes were advanced to collect soil gas screening samples. Soil gas screening sample data were used to determine if VOC contaminant sources are present in the unsaturated zone. Soil gas samples were collected at two depths: 15 feet and 35 feet bgs. Boreholes were advanced at each soil gas grid node. Figure 2-2a shows the soil gas screening locations.

Soil gas borings were advanced using a Geoprobe 6610 rig by CDM's drilling subcontractor. Teflon-lined 7/16 inch tubing was placed down the Geoprobe rod. The surface of the borehole was then sealed with beeswax. The screening instrument, a ppbRAE, was attached directly to the teflon tubing to analyze the soil gas. The screening instrument was calibrated before and after each daily sampling event. The end of the day calibration check was performed to ensure the accuracy of the readings taken throughout the day.

At each borehole location, the sample from 15 feet was measured first. Following completion of sampling procedures at 15 feet, the Geoprobe rods were pushed to 35 feet and the soil gas was measured.

The soil gas screening samples were purged and collected according to the QAPP Addendum. Upon completion, the soil borehole locations were tremie grouted to the surface with cement-bentonite grout and parking lot areas were patched with hot asphalt and sealant.

A tracer gas test was performed for every 20 samples collected to check for leakage at the ground surface. A plastic bucket was placed upside down over the borehole to create a controlled atmosphere. Helium was pumped into the bucket, inducing a helium enriched atmosphere. A helium detection probe was attached to the teflon tubing to detect any helium which made its way into the tubing from the controlled "surface" atmosphere. Each helium tracer test performed showed no detection of the gas within the tubing.

Three of the soil gas boreholes could not be advanced due to an underground garage located near the northeast corner of the grid.

2.2.3 Soil Gas Canister Sampling

Thirty soil gas canister samples were collected from new soil gas boreholes around the perimeter of office buildings 100 and 200 Garden City Plaza and at 100 Ring Road to obtain data to assess VOCs in soil gas. The locations were selected around the perimeter of each building to be as close to the building as logistically possible. Two samples, SGRF10 and SGRF11, were not collected due to the presence of underground utilities. In addition, four soil gas canister samples were collected in boreholes at Hazelhurst Park, along Clinton Road, to obtain data to assess VOCs in soil gas. Two samples were planned in Hazelhurst Park (SGHP-1 and SGHP-3), but an additional two samples (SGHP-2 and SGHP-4) were collected to confirm a hot spot at grid location A11 during the soil screening survey.

One soil gas canister sample was collected from each boring at 15 feet bgs for VOC analysis by EPA Method TO-15. One-liter Summa canisters were shipped to an offsite laboratory (Air Toxics, Inc) procured through EPA's headquarters air analytical contract. The soil gas canister locations (adjacent to the three buildings and in Hazelhurst Park) were also screened onsite for total VOCs with the ppbRAE, as described in Section 2.2.2. Figure 2-2b shows the soil gas canister sampling locations.

The soil gas samples were purged and collected according to the QAPP Addendum. Prior to sample collection, each Summa canister's initial pressure reading was checked.

If the initial pressure was outside of the -25 to -30 milliliters (ml) of mercury (Hg) range, the canister was not used. The final pressure of each canister was also recorded for QC purposes. The laboratory compared the initial vacuum pressure of the canister to the final pressure in the field to ensure no disruption occurred to the canister or the sample during shipment. The initial and final pressure values for the Summa canisters are shown on Table 2-6. Helium tracer tests were also performed for every 20 samples collected. This procedure was described in Section 2.2.2. Upon completion, the borehole locations were tremie grouted to the surface with cement-bentonite grout.

2.3 Ecological Characterization

CDM conducted a walkover ecological investigation, to determine habitats, species, and identify vegetation, primarily in the recharge basin areas. The purpose of the ecological investigation was to begin the first step of the Screening Level Ecological Risk Assessment (SLERA), which is to characterize the ecological resources at the site and to compile information on the site history and other available information (e.g., aerial photographs, consultation with other agencies). CDM also gathered information on federal and/or New York State rare, threatened, and endangered species in the area. The ecological characterization is described in Section 3.8.

2.4 Control of Investigation-Derived Waste

Investigation-derived waste (IDW) was stored onsite within a locked, fenced compound. Liquid waste (e.g., purge water from wells) was stored in 21,000-gallon holding tanks. Drilling mud and related cuttings were stored in 20 cubic yard covered roll-off containers. Waste decontamination fluids (from personal protective equipment and sampling equipment decontamination), disposal material related to site activities (e.g., used Tyvek coveralls and gloves), and all semi-solid wastes (e.g., drill cuttings) were drummed and stored in an onsite staging area. All IDW was sampled and disposed of by CDM's waste disposal subcontractor, BAY, Incorporated. The waste was disposed of in accordance with applicable local, New York State, and federal regulations and requirements.

2.5 Cultural Resources Survey

In May 2005, the Stage 1A level Cultural Resources Survey was performed on and around the site by the CDM subcontractor, John Milner Associates (JMA). The Stage 1A survey is the initial level of a cultural resource investigation and requires a comprehensive documentary research designed to identify known or potential historical, architectural, and/or archaeological resources within the site.

JMA evaluated the potential for any historical, architectural, or archaeological resources that might be impacted by the project activities and determined the probability that archaeological resources were present within the project area. All work was undertaken in accordance with the guidelines of the New York Archaeological Council's *Standards for Cultural Resources Investigations and the Curation of Archaeological Collections*, recommended for use by the New York State Office of Parks, Recreation, and Historic Preservation. The Stage 1A report was prepared in conformance with standard report format included in these guidelines and reflects contemporary organization and illustrative standards currently used in the field of professional cultural resource management. The Stage 1A Cultural Resource Survey for the Roosevelt Field site is attached as Appendix I.

3

Section Three

Section 3

Section 3
Physical Characteristics of the Study Area

3.1 Surface Features

The site is located in Nassau County, New York which lies within the Atlantic Coastal Plain. The topography of the central portion of Nassau County is characterized by a gently southward-sloping glacial outwash plain. Two linear chains of hills, the remnants of two glacial terminal moraines, border the outwash plain to the north. The southern limit of the outwash plain is defined by the low-lying salt marshes, tidal inlets and creeks, and beach-barrier islands along the Atlantic coast of southern Long Island. The southern chain of morainal hills, the Ronkonkoma moraine, extends from Queens eastward to form the South Fork of Long Island. The northern chain of hills, the Harbor Hill moraine, extends eastward to form the North Fork of Long Island (Franke and McClymonds 1972; Krulikas 1987a). The moraines converge to the west of Nassau County (Figure 3-1). The Ronkonkoma moraine reaches elevations of up to 400 feet above mean sea level (amsl).

The site is flat to gently undulating. The site slopes from approximately 100 feet amsl at the northern edge of the site (along Old Country Road) down to approximately 70 feet amsl about 4,000 feet south-southwest of Roosevelt Field, along Clinton Road (USGS *Freeport* 1:24,000 topographic quadrangle and Figure 3-2). The Roosevelt Field shopping center is located on a flat area originally called Hempstead Plains (Weston 2000), which is at an elevation of approximately 90 feet amsl.

3.2 Soils

Five of the six classified soil types are expected to occur onsite (United States Department of Agriculture [USDA] Natural Resources Conservation Service [NRCS] 2006), as shown on Figure 3-3. The soil units are described below.

<u>Urban Land (Ug)</u>: This soil classification describes nearly level to strongly sloping areas where asphalt, concrete, buildings, or other impervious materials cover more than 85 percent of the land's surface. Slopes range from 0 to 15 percent.

<u>Pits, ground-water recharge (Pg)</u>: These features are found in three locations along the southern perimeter of Roosevelt Field and approximately one mile south of Stewart Avenue.

<u>Hempstead Series (He, Uh):</u> These soils consist of very deep, well drained soils on outwash plains. They are nearly level or gently sloping soils formed in a silty mantle overlying highly siliceous stratified sand and gravel outwash materials. Permeability is moderate in the surface soil and very rapid in the substratum. This soil series is commonly found on terraces associated with Mineola soils located adjacent to drainage sequences.

<u>Hempstead silt loam (He)</u>: This soil is found in grassy areas while Urban Land-Hempstead Complex (Uh) is found underlying urban areas, especially southwest of Stewart Avenue.

Mineola Series (Um): These soils consist of very deep, moderately well-drained soils on outwash plains. These soils form a thin mantle of loamy outwash deposits overlying stratified sand and gravel. Slopes range from 0 to 3 percent. Typically, the soils form along the bottoms of old glacial melt water channels.

The surface soil thickness ranges from 15 to 30 inches and corresponds to the depth of stratified sand and gravel. Redoximorphic features consisting of concentrations of iron oxides occur between 18 and 30 inches of the soil surface. Rock fragment content ranges from 0 to 35 percent in the A horizon and from 0 to 75 percent for individual layers in the B and C horizons. Rock fragments are mainly gravel of granitic origin with up to 20 percent cobblestones in the B and C horizons. Reaction ranges from very strongly acidic to moderately acidic.

Riverhead Series (UrB): This series consists of very deep, well drained soils formed in glacial outwash deposits derived primarily from granitic materials. They are on outwash plains, valley trains, beaches, and water-sorted moraines. Slope ranges from 0 to 50 percent.

Thickness of the surface soil ranges from 20 to 40 inches. Rock fragments, primarily gravel, range from 0 to 35 percent in the A horizon; 0 to 35 percent in the B horizon; and 5 to 40 percent in the C horizon. Some C horizons, below 40 inches, range from 5 to 60 percent rock fragments. Reaction ranges from extremely acidic to moderately acidic.

3.3 Geology

3.3.1 Regional Geology

The site is located within the Atlantic Coastal Plain Physiographic Province. A history of coastal submergence and emergence spanning the Cretaceous Period, significant differential erosion during the Cenozoic, and glaciation during the Quaternary is reflected in the present day geology of Long Island (Lubke 1964). The geology of Long Island is characterized by a southeastward-thickening wedge of unconsolidated sediments unconformably overlying a gently-dipping basement bedrock surface (Figure 3-4). The wedge ranges in thickness from zero feet beneath Long Island Sound to the north, on the submerged western margin of the Coastal Plain, to more than 2,000 feet under the southern shores of Long Island.

The unconsolidated sedimentary wedge in the vicinity of the Roosevelt site in central Nassau County thickens from about 800 feet at the northern edge of the Town of Hempstead to approximately 1,500 feet thick beneath the barrier islands (Krulikas 1987a). The stratigraphy for the Town of Hempstead, New York (located just south of Garden City, New York) is presented in Figure 3-5 and is described in detail below.

Basement

The basement rock is composed of Precambrian to Early Paleozoic igneous or metamorphic consolidated bedrock. Unconformably overlying the basement rock is a thick succession of Late Cretaceous deposits: the Raritan and overlying Magothy Formations, both of fluvio-deltaic depositional origin. The Upper Cretaceous deposits are unconformably overlain by a veneer of Pliocene and Pleistocene deposits, chiefly of glacial origin (Franke and McClymonds 1972).

Cretaceous

Raritan Formation: The Raritan Formation is divided into the basal Lloyd Sand Member and the overlying Raritan Clay Member. The Lloyd Sand rests unconformably on bedrock and is 200 to 250 feet thick in the Hempstead area (Krulikas 1987a; Buxton, *et al.* 1989). The top of the Lloyd Sand is found at approximately 600 feet below msl. It is composed of white and grey fine to coarse sand and gravel, commonly with a clayey matrix. The contact with the overlying clay member is gradational.

The Raritan Clay Member is composed chiefly of bedded variegated clay and silt, locally containing interbedded sands. Lignite fragments and iron and pyrite nodules are common. The clay member is approximately 100 feet thick in the Hempstead area (Smolensky, *et al.* 1989). The Raritan Clay is the most widespread hydrologic confining layer on Long Island. Figure 3-6 is a subcrop map of the top of the Raritan Clay Member in the Hempstead area (Smolensky, *et al.* 1989). The map indicates the Raritan's updip extent generally is located subparallel to the northern coast of Nassau County. The clay unit dips gently to the south-southeast. The top of the clay member is approximately 500 feet below msl on the southern margin of the site. A deep test well drilled by the Village of Garden City in 1982 (well number N10033) was completed within the Raritan Clay Member. The member was described as a predominantly solid grey clay, with fine to medium-grained sand interbeds. The top of the Raritan Clay Member was identified at approximately 400 feet below msl at former well N5485 located at the Roosevelt Field mall (Eckhardt and Pearsall 1989) and 504 feet below msl at wells N10033 and N10034, located about one mile further to the southwest (Buxton, *et al.* 1989).

Matawan Group-Magothy Formation: The Magothy Formation is the only unit in the Matawan Group that occurs in the Garden City area. The Magothy Formation unconformably overlies the Raritan; the contact is commonly marked by a change from the solid clays of the Raritan Clay Member to coarse sands and gravels of the basal unit of the Magothy Formation. The dominant Magothy Formation lithology generally is fine to medium quartz sand, interbedded clayey sand with silt, clay, and gravel interbeds or lenses. Interbedded clay is more common toward the top of the formation. The thickness of the Magothy Formation in the Hempstead area varies between 350 feet in the northern portion of Hempstead to over 800 feet beneath the barrier islands (Krulikas 1987a). The Magothy Formation is approximately 525 feet thick in well N10033 at the Roosevelt site. The top of the Magothy Formation is encountered at approximately 30 feet above msl (50 feet bgs) at the Roosevelt site, dipping gently southwards down to approximately mean sea level two miles south in the Village of Hempstead (Krulikas 1987a; Smolensky, *et al.* 1989)

Cenozoic-Quaternary

After the Cretaceous, deep erosion of the land surface took place as a response to fluctuations in sea level. Sedimentological evidence indicates that sea level decreases exposed the entire Atlantic continental margin during the Miocene epoch, which would have promoted rejuvenation and deep incision of rivers and streams across the Coastal Plain (Fulthorpe, *et al.* 1999). Later deposition of abundant fluvial and glacial clastic deposits during the Pliocene and Quaternary filled these incised buried valleys. The top of the Cretaceous sequence is marked by a highly irregular erosion surface upon which rests on Pleistocene and, in some places, Pliocene age deposits. The top of the Cretaceous unconformity surface is incised by a predominantly north-northeast and south-southwest trending paleovalley beneath the barrier islands south of the site (Krulikas 1987a).

Pleistocene Deposits: Deposits of Pleistocene age mantle the Cretaceous formations. Within the study area, the Pleistocene deposits include three depositional sequences: the fluvial Jameco Gravel and marine Gardiners Clay; and the much more widespread Late Pleistocene deposits of the Wisconsin glacial stage, which are called Upper Glacial Deposits. Undifferentiated gravels and clays described in buried valleys within southern Long Island have been attributed to the Jameco Gravel and Gardiners Clay units. The Jameco Gravel and Gardiners Clay units are well-defined, mappable stratigraphic units beneath the southern margin of Long Island where they are of hydrogeological significance. These stratigraphic units are not recognized in the vicinity of the Roosevelt site. The remainder of the Pleistocene succession belongs to the Wisconsin glacial stage Upper Glacial Deposits.

The thickness of the Pleistocene Upper Glacial Deposits in central Nassau County varies but averages approximately 100 feet. The thickness and distribution of the Upper Glacial Deposits were controlled by the older, now buried, paleotopography. The pattern of stream and river valleys that dissected the surface of Long Island during the Cenozoic likely was later modified by Pleistocene ice sheets and related meltwater erosion and deposition.

The Upper Glacial Deposits in the Hempstead area rest on the irregular unconformity surface of the Magothy Formation and are composed mainly of stratified beds of fine to coarse-grained sand and gravel; thin beds of silt and clay are interbedded with coarse-grained material (Krulikas 1987a). These glaciofluvial deposits were laid down by meltwater streams on outwash plains and spillways during the advance, stagnation, and recession of the ice. Discontinuous bodies of silt and clay were deposited in glacial lakes.

The outwash that constitutes the bulk of the deposits is yellow and brown, or, in some places, grey. The stratified sand and gravel consists mainly of iron-stained quartz but includes igneous and metamorphic lithoclasts and heavy minerals.

3.3.2 Site-Specific Geology

3.3.2.1 Natural Gamma Logs

Natural gamma logging was performed in the eight multi-port monitoring well boreholes. The logs are presented in Appendix E. The natural gamma geophysical tool was run inside the boreholes, after completion of drilling, to identify intervals of high clay content (i.e. possible low permeability zones) which may affect contaminant transport.

Lithologic samples were not collected during HSA and mud-rotary drilling activities. Consequently, lithologic logs could not be created for direct comparison with the gamma logs. However, the gamma logs are sufficient to determine vertical changes in lithostratigraphy.

The amplitude of gamma log readings generally can be interpreted and may broadly correspond to lithological units that are sand rich (low Delta Epsilon responses) and clay rich (high Delta Epsilon responses). The regional geology of this part of Long Island is reflected in the observed log responses. The site is underlain by a thick succession of non-lithified late Cretaceous-age sands, silts, and clays which are overlain by unconsolidated Pleistocene glacial and glacio-lacustrine lithostratigraphic units. Interpretation of the gamma log data has been achieved through review of published reports and particularly site-specific data presented in Eckhardt and Pearsall (1989).

Results

Natural gamma log descriptions are presented below, by multi-port well location.

SVP-1

The natural gamma log for the upgradient well has relatively low Delta Epsilon gamma log responses, although somewhat ragged in shape. The log indicates responses generally less than 10 counts per second (cps), for the interval from the ground surface to approximately 130 feet bgs. At this depth, the reading shows an upward response to above 15 cps; this deflection may indicate the approximate top of the Magothy Formation. Within the Magothy Formation, the readings are generally below 10 cps, with higher responses at approximately 228-230 feet bgs, 261-263 feet bgs, and 405-408 feet bgs. These zones of higher readings do not indicate areas that would significantly affect contaminant migration.

SVP-2

The natural gamma log for SVP-2 has very low Delta Epsilon gamma log responses, below 10 cps, with one exception at approximately 265 feet bgs. The top of the Magothy Formation is not as evident at this location as in other locations. No zones of high clay content that might affect contaminant transport were evident at this location.

SVP-3

The natural gamma log for SVP-3 also has very low Delta Epsilon gamma log responses, below 10 cps, with exceptions at the following intervals: 12-19 feet bgs, 89-94 feet bgs, 203-216 feet bgs, and 322-330 feet bgs. The top of the Magothy Formation is not as evident at this location as in other locations. These intervals indicate zones of higher clay content, and the thicker zones may affect vertical contaminant transport.

SVP-4

The natural gamma log for SVP-4 has very low Delta Epsilon gamma log responses, below 10 cps, with one exception at the interval from approximately 17-22 feet bgs.

The top of the Magothy Formation is not as evident at this location as in other locations. No zones of high clay content that might affect contaminant transport were evident at this location.

SVP-5

The natural gamma log for the upgradient well has relatively low Delta Epsilon gamma log responses. The log indicates responses generally less than 10 counts per second (cps), for the interval from the ground surface to approximately 98 feet bgs. At this depth, the reading shows an upward response to above 15 cps; this deflection may indicate the approximate top of the Magothy Formation. Within the Magothy Formation, the readings are generally below 10 cps, with higher responses at the following intervals: 98-108 feet bgs, 209-218 feet bgs, 284-287 feet bgs, and 401-403 feet bgs. These intervals indicate zones of higher clay content, and the thicker zones may affect vertical contaminant transport.

SVP-6

South of Stewart Avenue, the log response for SVP-06 has a similar shallow log response to those to the north, with the majority of responses below 10 cps. A zone of higher responses occurs from approximately 66-77 feet bgs that declines rapidly and flattens out to below 5 cps down to approximately 120 feet bgs. At that depth, which may indicate the top of the Magothy Formation, a high response continues to approximately 180 feet bgs; below this, the log response is ragged and appears similar to the lower 250 to 300 feet in the well logs in the mall area. The thicker zones of increased responses may affect vertical contaminant transport.

SVP-7

The gamma log response from SVP-07, located southwest of the mall, has a different response compared with the other log signatures. The first 250 feet of the log below the ground surface consists of responses that are generally below 10 cps, diminishing to below 5 cps towards 250 feet bgs. A slight increase is evident from 252-255 feet bgs, and a marked increase is evident from 358-369 feet bgs. Below that, the responses dip again to below 5 cps, but gradually increase for the remainder of the borehole. The zone of higher clay content from 358-369 feet bgs may affect contaminant transport.

SVP-8

In SVP-08, the gamma ray response is similar to the wells to the north, in and around the mall area. Low gamma log responses (mostly < 5 cps) are found within the first 90 feet bgs. At approximately 90 feet bgs, there is a slight increase in the response, which may indicate the top of the Magothy Formation. From that point, the responses gradually increase to an abruptly high response at approximately 200 feet bgs. From 200 feet bgs to approximately 298 feet bgs, the responses are relatively low (below 10 cps). The responses increase again from approximately 298-373 feet bgs, and decrease back to below 10 cps for the remainder of the borehole. The increased responses may not significantly affect contaminant transport since they are still rather low.

Stratigraphic Interpretation

The top of the Cretaceous sequence is marked by a highly irregular erosion surface upon which rests deposits of Pleistocene and, in some places, Pliocene age. A structural contour map of the top-Cretaceous for the Hempstead area, indicates the top-Cretaceous unconformity surface is incised by a predominantly north-northeast and south-southwest trending paleovalley beneath the barrier islands south of the site (Krulikas 1987a). This incised paleovalley may be present in the area around SVP-7, as indicated by the very low natural gamma log responses in the top 250 feet. In general, the top of the Magothy formation, also known as the Cretaceous-Tertiary unconformity, is suggested in the natural gamma logs from SVP-1 (130 feet bgs), SVP-6 (120 feet bgs), SVP-7 (250 feet bgs), and SVP-8 (90 feet bgs). However, lithologic data from USGS suggest that the Cretaceous unconformity is approximately 100 feet bgs. At SVP-7, the Cretaceous unconformity is inferred from the gamma log at approximately 250 feet bgs. This may be evidence of deep erosional incision by a post-Cretaceous drainage channel. This feature could be related to north-south trending paleovalleys found subcropping in the Quaternary elsewhere on Long Island. For example, a similar paleovalley has been identified in the town of Smithtown further to the northeast (CDM 2004b). The boundary is not as evident in the logs from the wells in the mall area (SVP-2 through SVP-5).

A north-south trending stratigraphic cross section that covers the area from SVP-1 in the north to SVP-8 in the south, is presented as Figure 3-7. As shown in this figure, the top of the Magothy Formation is at approximately -130 feet below sea level (as evidenced in SVP-1, and carried over to the Garden City Plaza area, where the contact was not as evident. One exception is shown in the area just east of SVP-7, which indicated the top of the Magothy Formation at approximately -250 feet below sea level. This area represents a possible incised paleovalley.

3.4 Hydrogeology

3.4.1 Regional Hydrogeology

The geometry of sedimentary units within the Coastal Plain varies greatly, which has significant hydrogeologic implications. For example, Upper Cretaceous sands may occur as fan-shaped deposits laid down in a fluvial setting; as elongate, sinuous, "shoe string" channels in deltaic settings; as coarse, thick, well-sorted linear accumulations in coastal dune complexes; or as thin, sheet-like bodies in shelf environments. These sandy deposits act as regionally or locally important water bearing zones, or aquifers. In contrast, the deposition of clay in the marine or glaciolacustrine environment (such as the Raritan Clay Member) typically occurs in low energy, protected sedimentary environments. Thus, clay beds are generally laterally continuous, and may drape over sand sheets and channel deposits and act as aquicludes. Along the fringes of clay beds, however, the clay may intermix with the surrounding coarser deposits.

The unconsolidated units of Late Cretaceous to Pleistocene age, which overlie the virtually impermeable basement bedrock, constitute the wedge-shaped aquifer system underlying the Atlantic Coastal Plain (Figure 3-4). The hydrogeologic nature of the sedimentary units primarily is determined by their texture and degree of sorting.

Unconfined aquifers are recharged by infiltration in outcrop areas; confined aquifers are recharged by vertical leakage through overlying "leaky" confining units. Regional discharge is typically into streams and rivers (via upward leakage through confining units or confined aquifers), and ultimately to the Atlantic Ocean. In areas where confining units are regionally extensive, vertical components of flow are superimposed on horizontal components, thereby steepening hydraulic gradients. Confining units of small areal extent do not significantly affect the regional flow.

Eight major hydrostratigraphic units have been identified beneath Long Island, from oldest to youngest: consolidated bedrock, the Lloyd aquifer, the Raritan confining unit, the Magothy aquifer, the Monmouth Greensand, the Jameco aquifer, the Gardiners Clay, and the Upper Glacial aquifer. These hydrogeologic units correspond with regional geologic units, as shown in Figure 3-5. Neither the Monmouth Greensand, Jameco aquifer, nor the Gardiners Clay have been identified within the Roosevelt site near Hempstead. The Lloyd aquifer unit is a confined aquifer subcropping over the entire island. The Magothy Formation and Upper Glacial aquifers overlying the Raritan confining unit are found across most of Long Island and can be confined, semi-confined, and unconfined aquifers; combined, they are the most productive and heavily utilized groundwater resource on Long Island.

Available well data for the principal aquifer units (Lloyd, Magothy, and Upper Glacial aquifers) on Long Island were compiled to compare the average water-transmitting properties of the aquifers (McClymonds and Franke 1972). The results of the study indicate that average transmissivities are highest for the Magothy aquifer (32,160 square feet per day [ft^2/d]), 26,800 ft^2/d in the Upper Glacial aquifer, and the lowest in the Lloyd aquifer (12,060 ft^2/d). Average conductivities are highest in the Upper Glacial aquifer (228 feet per day [ft/d]), 174 ft/d in the Magothy aquifer, and the lowest in the Lloyd aquifer (48 ft/d). Specific yields in the Upper Glacial and Magothy aquifers are 0.30 and 0.15, respectively (Krulikas 1987b).

The shallow unconfined water table aquifer over most of Long Island is within the Upper Glacial aquifer unit. In general, water north of the regional groundwater divide, which trends east-west along the island (and is located approximately under the Long Island Expressway, four miles north of the site), moves northward toward Long Island Sound, and water south of the divide flows southward toward the Atlantic Ocean (Krulikas 1987a). The rate of horizontal flow in the Upper Glacial aquifer is controlled by the hydraulic gradient of the water table and by the water-transmitting characteristics of the aquifer material. Horizontal velocity in the upper glacial aquifer generally ranges from 1 to 2 ft/d; vertical flow is much slower, especially where confining layers restrict the upward or downward movement of water. Residence times in the Upper Glacial aquifer generally are less than 30 years (Franke and Cohen 1972). In general, groundwater flow in deeper aquifers is controlled by regional-scale flow systems.

Depth to groundwater on Long Island is less than 150 feet in most areas, ranging from zero feet along the shores and stream channels to greater than 250 feet in the extreme northwestern part of Suffolk County, which begins approximately 10 miles east of the site. The depth to groundwater primarily is determined by the island's glacial geology and associated topographic features, but also is affected by local and temporal variations in precipitation and groundwater withdrawals.

The water table is a subdued expression of the island's topography; thus, the depth to water generally is greater in the topographically high areas, such as those near the north shore and east-west trending glacial moraines that form the "spine" of the island, than in low-lying areas, such as stream valleys and most of the southern half of the island.

Groundwater Recharge

Groundwater on Long Island is derived from precipitation. The volume of water that percolates down to the water table and recharges the groundwater is the residual of the total precipitation not returned to the atmosphere by evapotranspiration or lost by runoff. Due to the permeable nature of the surface soils and substrata and the generally gentle slope of the land surface, infiltration is high. The rate of natural recharge varies greatly from season to season and from year to year, depending on such factors as evapotranspiration, air and soil temperatures, soil-moisture conditions, and the nature and seasonal distribution of precipitation. At the Roosevelt site, which is mostly covered by impervious surfaces such as buildings, paved parking lots, and roads, surface runoff is directed to dry wells or the nearby recharge basins. Natural replenishment of the Magothy Formation aquifer zones is achieved by downward movement of water from the shallow aquifer through discontinuities in clayey and silty beds.

3.4.2 Site-Specific Hydrogeology

Much investigation has been conducted on the hydrogeology of Nassau County, and in particular, the Roosevelt Field area. As such, the majority of information in this section is based on historical literature from USGS and others. Beneath the Roosevelt site, only the Lloyd, Magothy Formation, and Upper Glacial aquifers have been recognized. This study is concerned only with the aquifer system above the Raritan Clay confining unit. The Magothy Formation and Upper Glacial aquifer hydrogeology in the Roosevelt Field area is described below, from data principally presented in Eckhardt and Pearsall (1989).

The Magothy aquifer is approximately 525 feet thick in the vicinity of the mall. Soil boring logs from previous investigations indicate that the succession is characterized by vertically-alternating parasequences and laterally-interfingering lithosomes of sand, clayey sand, sandy clay, lignite, and some gravel in the basal section. The deposits are fluvio-deltaic in origin and have considerable vertical and lateral heterogeneity. Discontinuous layers of grey lignitic clay are common in the upper zones of the Magothy Formation, creating predominantly confined conditions in the deeper zones (Eckhardt and Pearsall 1989).

The Upper Glacial (water table) aquifer unconformably overlies the Magothy Formation aquifer and consists of glacial outwash that is predominantly stratified sand

and gravel. At the Roosevelt site, the outwash deposits are fairly uniform in grain size distribution and lithology. The water table ranges from 25 to 50 feet bgs. The hydraulic conductivity of the Upper Glacial aquifer in southern Nassau County averages about 250 ft/d (McClymonds and Franke 1972).

<u>Water Level Measurements and Groundwater Flow</u>

CDM recorded pressure readings at all multi-port well ports and conducted synoptic water levels at existing wells prior to each sampling round to calculate water level elevations at the site. Table 3-1a summarizes the multi-port measurements and calculated water level elevations for sampling Rounds 1 and 2. Table 3-1b summarizes the water level measurements and elevations for the existing monitoring wells. Three wells (GWX-8068, GWX-8474, and GWX-8475) could not be measured because they contained pumps and associated hardware.

CDM analyzed water elevation data at various elevations, as follows: shallow groundwater within the upper glacial aquifer (approximately 50 feet bgs); groundwater at the top of the Magothy Formation (approximately 100 feet bgs); groundwater within the core of the contaminant plume (approximately 250 feet bgs); and deep groundwater (approximately 400 feet bgs). Figures 3-8a through 3-8b illustrate the groundwater elevations and flow for each of these elevations during Round 1. In each figure, the general horizontal groundwater flow trend is to the south; Round 2 data followed this same trend. A small groundwater sink is located in the vicinity of SVP-2. Based on Round 1 data for the shallow aquifer, the groundwater flow gradient is 0.00156. Given this flow gradient, a porosity of 0.15, and the conductivity for the Magothy aquifer (approximately 174 ft/d), the flow rate is estimated to be 1.8 ft/d.

Water level elevation data from the multi-port wells provided an opportunity to evaluate vertical groundwater flow within each well location. In all multi-port wells, the vertical groundwater flow is downward. The five multi-port wells in the mall area have similar vertical gradients, with the differences between water levels in the shallow and deep ports within each well ranging from 1.8 - 2.9 feet. Further to the south, the vertical gradients become larger: 3.2 feet in SVP-7; 8.2 feet in SVP-8, and 9.7 in SVP-6. The higher vertical gradients in SVP-8 and SVP-6 are most likely caused by pumping at the Hempstead wells, located one block south (downgradient) of GWM/SVP-8.

3.5 Meteorology

The Village of Garden City is located on west-central Long Island, southeastern New York, where the climate is temperate maritime. Climate is more influenced by the ocean than by the adjacent mainland. It is characterized by mild winters and relatively cool summers, and is free from sudden or extreme changes in temperature (Warren, *et al.* 1968). The average annual temperature is about 51 degrees Fahrenheit (° F), the average January temperature is about 30° F, and the average July temperature is about 70° F. The maximum annual temperature is 95° F, and the minimum annual temperature is 0° F. The maximum and minimum observed temperatures are 102° F and -20° F. The growing season on Long Island is about 180-200 days, from the end of

April to the end of October. During the average year, the percentage of possible sunshine ranges from about 50 percent in January to 65 percent in July and averages 62 percent during the growing season. The prevailing winds are from the west, shifting from the southwest in summer to the northwest in winter. Average wind speed is about 12 miles per hour.

Precipitation is the only source of freshwater for streams and groundwater in the Hempstead area. Average precipitation is about 42 inches per year; included within this value is an average annual snowfall of 25-30 inches, most of which falls between December and March (Miller and Frederick 1969). The greatest number of snow storms occur during February.

3.6 Surface Water Hydrology

No naturally-occurring surface water bodies are present in the vicinity of the Roosevelt site. The closest stream is East Meadow Brook, which is about 1.5 miles southeast of the site and flows south towards Great South Bay and the Atlantic Ocean. The largest body of freshwater near the site is Hempstead Lake, located at the head of Millbrook Creek, approximately four miles south of the site (Franke and McClymonds 1972). The majority of natural ponds and lakes are kettleholes that intersect the water table (Krulikas 1987a). In general, the sandy nature of natural soils on Long Island promotes fast infiltration of precipitation (rainwater) from the ground surface. Almost the entire site area is paved or is occupied by buildings; therefore, any surface rainwater runoff is routed into storm water collection systems and commonly is discharged directly to either dry wells or recharge/detention basins.

The Pembrook recharge basin and two Nassau County recharge basins are man-made water table recharge basins located on or near the site. One of the Nassau County basins is located immediately south of the Pembrook Basin, approximately 1,500 feet southwest of the Roosevelt Field Shopping Center; the other county recharge basin is located about 1,000 feet southeast of the shopping center (see Figure 1-2). The privately-owned Pembrook Basin formerly received cooling water discharge (Eckhardt and Pearsall 1989). Currently it appears to receive surface water runoff during storm events. The Nassau County basins receive storm runoff from the municipal storm water collection system.

3.7 Population and Land Use

The Roosevelt site is located in a very densely developed portion of Nassau County, a mixed commercial-residential area. Current land use for the area surrounding the site is mixed commercial and residential. The site is in East Garden City (area = 3.0 square miles) within the Town of Hempstead. East Garden City supports 979 residents, 275 households and 243 families. Of the 275 households, 47.6 percent have children under the age of 18 living with them. The Village of Garden City (area = 5.3 square miles) lies south and west of the site. Garden City supports approximately 21,672 residents, 7,386 households and 5,857 families. Of the 7,386 households, 36.1percent have children under the age of 18 living with them. The Roosevelt Field Mall is the largest in New

York State and the 11th largest in the United States, with an area of 2,146,000 square feet. The mall provides employment for several thousand people and receives millions of visitors each year (US Census Bureau 2005).

The former Roosevelt Field is characterized by commercial office development on the west (Garden City Plaza); a large regional shopping mall complex on the east (Roosevelt Field Shopping Center); an area occupied by undeveloped woodland, recharge basins, and Stewart Avenue School immediately south of the office park; and mixed retail/commercial businesses immediately south of the shopping mall. Immediately beyond Stewart Avenue is an area of retail strip development, commercial, and light industrial development. This area includes two state and federal hazardous waste sites that formerly released solvents to groundwater (the Pasley and Purex sites). Beyond that, to the south and south-southwest, land use is predominantly single family residential. Homes in this area of Garden City and Hempstead use the municipal water supply pumped from village well fields for potable drinking water and the municipal sewer system for sanitary waste water disposal.

3.8 Ecological Characterization

An ecological reconnaissance was performed on September 7, 2006 in accordance with the CDM Final Work Plan (CDM 2004a) and following the USEPA Ecological Risk Assessment Guidance for Superfund (ERAGS) (USEPA 1997). For this field characterization, USGS topographic maps and aerial photos of the site were reviewed.

3.8.1 Habitat and Biota

More than 90 percent of the site is heavily urbanized and developed, and consists of a large shopping mall, numerous restaurants, a movie theater, and office buildings. However, small areas of heavily disturbed habitat are situated within site boundaries. The ecological reconnaissance focused on these areas which included a wooded parcel situated southwest of the shopping mall extending north as a small strip of undeveloped land to Old Country Road. Two groundwater recharge basins, the Pembrook and Nassau County basins, are located within the southern portion of the wooded area. Throughout these areas were evidence of disturbance activities including the placement/disposal of fill material, excavating, dumping of construction debris and miscellaneous refuse (e.g., bottles, tires, bags).

The flora and fauna observed at the site are typical of a disturbed, urban landscape. Vegetative communities were indicative of disturbed and waste areas, and consisted of native and invasive species commonly found in urbanized areas . The main portion of the wooded area prior to extending as a small strip of land northward to Old Country Road was dominated by the trees boxelder (*Acer negundo*) and black locust *(Robinia pseudoacacia*) with Norway maple (*Acer platanoides*) and catalpa (*Catalpa speciosa*) also present. Understory and herbaceous species were dominated by saplings of the above species, amur honeysuckle (*Lonicera maackii*), Russian olive (*Elaeagnus angustifolia*), Asiatic bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*), poison ivy (*Toxicodendron radicans*), garlic mustard (*Alliaria officinalis*), common ragweed (*Ambrosia artemisiifolia*), horseweed (*Erigeron canadensis*) and goldenrod (*Solidago* spp.). Wildlife observed in this area consisted of gray squirrel (*Sciurus carolinensis*) and various song birds including blue jay (*Cyanocitta cristata*), gray catbird (*Dumetella carolinensis*), American robin (*Turdus migratorius*), and mourning dove (*Zenaida macroura*).

Extending north to Old Country Road dominant tree species were black locust, white pine (*Pinus strobus*), red oak (*Quercus rubra*) and hickory (*Carya* spp.). Where present, the pines were situated in straight rows parallel to Clinton Road, and were most likely planted for aesthetics and for use as a natural barrier. The understory was dominated by saplings of cherry (*Prunus* spp.) and hickory, burning bush (*Euonymus atropurpurea*) and amur honeysuckle. Dominant herbaceous cover consisted of garlic mustard and poison ivy. Wildlife observed consisted of those found in the main portion of the wooded area.

No standing water was present within the central portion of the Nassau County Basin at the time of the ecological characterization; however, some surface water was present within the northwest corner. The source of water was a culvert presumably used for routing stormwater into the basin as evidenced by the presence of drift lines and debris. Surrounding this area was a small patch of common reed (*Phragmites australis*); however, the majority of the basin interior consisted mostly of goldenrod. Moving out of the basin interior, vegetative communities were dominated by species found in other areas such as cherry, black locust, boxelder, red oak, multiflora rose and poison ivy. Wildlife observed consisted of song birds observed in other areas and one hairy woodpecker (*Picoides villosus*).

At the time of the ecological characterization, standing water was present within a portion of the Pembrook Basin, and was estimated not to exceed two feet in depth; however, the depth was not verified. Evidence such as drift lines and debris suggest that water levels often fluctuate. Furthermore, the complete lack of both submergent and emergent aquatic vegetation suggest that the basin is often dry, most likely because of quick percolation of ponded water through the sandy substrate, and aided by evaporation. Permanent wetlands are not supported by the area basins because the water inflow is from stormwater runoff, and the generally sandy soils result in rapid infiltration of water into the substrate. Finally, no fish or amphibians were observed in or near the water. No evidence of groundwater discharges were present in this area. Similar to other areas on site, vegetative communities within the Pembrook Basin indicated disturbed conditions. The few trees present within the open basin interior were small in size and consisted mostly of pioneer and invasive species such as grey birch (*Betula populifolia*), aspen (*Populus* spp.) tree-of-heaven (*Ailanthus altissima*), and sumac (*Rhus* spp.). Dominant herbaceous species consisted of common mullein (*Verbascum thapsus*), purslane (*Portulaca oleracea*) and lady's thumb (*Polygonum persicaria*), and are typically associated with waste areas. Moving out of the basin interior, vegetative communities were dominated by grey birch and aspen along with other species found on site including black locust, boxelder, red oak, multiflora rose, Asiatic bittersweet and poison ivy.

Wildlife within the Pembrook Basin and its adjacent upland areas did differ slightly from what was observed in other site areas. Within the ponded portion of the basin interior raccoon tracks were noted and greater yellow legs (*Tringa melanoleuca*) were observed wading. Killdeer (*Charadrius vociferus*) were observed in the dry open areas. In addition, numerous warblers were observed moving about in vegetation located on the slopes of the basin along with other song birds. Finally, on the upland edge of the basin near the larger wooded area a single American toad (*Bufo americanus*) was observed.

3.8.2 Threatened, Endangered and Rare Species, and Sensitive Environments

Information regarding the presence of threatened and endangered species and ecologically sensitive environments that may exist at or in the vicinity of the site was requested from the New York Natural Heritage Programs of NYSDEC and the U.S. Fish and Wildlife Service (USFWS) via EPA. Copies of letters from NYSDEC and USFWS are included in Appendix J.

In correspondence dated September 19, 2006, NYSDEC reported that a review of their records for the site and surrounding two-mile radius indicated that the following threatened and endangered species were observed at the locations noted below:

- Threatened Species
  - Upland Sandpiper (*Bartramia longicauda*) at Mitchel Field, Hempstead Plains (approximately two miles southeast of the site) east of Nassau Community College located in Hempstead, NY.
  - Stargrass (*Aletris farinosa*) at Mitchel Field (approximately two miles southeast of the site) east of Nassau Coliseum located in Hempstead, NY.
  - Green Milkweed (*Asclepias viridiflora*) at Mitchel Field (approximately two miles southeast of the site) east of Nassau Community College located in Hempstead, NY.
  - Little-leaf Tick-trefoil (*Desmodium ciliare*) (approximately two miles southeast of the site) east of Nassau Coliseum located in Hempstead, NY.
  - Bushy Rockrose (*Helianthemum dumosum*) (approximately two miles southeast of the site) east of Nassau Coliseum located in Hempstead, NY.
  - Flax-leaf Whitetop (*Sericocarpus linifolius*) (approximately two miles southeast of the site) east of Nassau Coliseum located in Hempstead, NY.
  - Slender Crabgrass (*Digitaria filiformis*) (approximately two miles from the site) based on historical records; last sightings reported in 1899 and 1922, in North Hempstead, NY and Hempstead, NY, respectively.

- Swamp Sunflower (*Helianthus angustifolius*) (approximately two miles from the site) based on historical records; last sighting reported in 1919, in Hempstead, NY.

- Endangered Species

  - Sandplain Gerardia (*Agalinis acuta*) at Mitchel Field (approximately two miles southeast of the site) east of Nassau Coliseum located in Hempstead, NY.

  - Midland Sedge (*Carex mesochorea*) at Mitchel Field (approximately two miles southeast of the site) east of Nassau Community College located in Hempstead, NY.

  - Few-flowered Nutrush (*Scleria pauciflora var. caroliniana*) at Mitchel Field (approximately two miles southeast of the site) east of Nassau Coliseum located in Hempstead, NY.

  - Soapwort Gentian (*Gentiana saponaria*) (approximately two miles from the site) based on historical records; last sighting reported in 1923 in Hempstead, NY.

- Unlisted Species

  - A hand-maid Moth (*Datana ranaeceps*) (approximately two miles southeast of the site) east of Nassau Coliseum located in Hempstead, NY.

The NYSDEC listed Coastal Plain Pond Shore (Hempstead Lake) and Hempstead Plains Grasslands as significant habitats. Hempstead Lake is located approximately 3.5 miles south of the site; Hempstead Plains are located approximately two miles southeast of the site, east of Nassau Community College.

During the ecological reconnaissance in September 2006 no threatened or endangered species were observed on or near the Old Roosevelt Field site.

4

Section Four

Section 4
Nature and Extent of Contamination

This section discusses the nature and extent of groundwater and soil gas contamination at, and downgradient of, the site. Section 4.1 presents the approach to the contamination evaluation, which includes applicable screening criteria for groundwater and soil gas, and the selection of site-related contaminants. Section 4.2 presents information on background data. Section 4.3 presents screening and analytical data obtained during the RI field program, and includes a discussion of the nature and extent of groundwater and soil gas contamination. Section 4.4 compares the groundwater and soil gas results. A complete set of analytical data is provided in Appendix K. A summary of data quality assurance/quality control (QA/QC) measures and an evaluation of data usability are included in Appendix L.

4.1 Approach to the Evaluation of Contamination

The main contaminants at the Roosevelt site are VOCs. The characterization and evaluation of the nature and extent of contamination in groundwater and soil gas are focused on those VOCs determined to be related to activities at the site when it operated as an airfield. Site-related VOCs were selected based on historical data, as described in Section 4.1.2. Although all detected contaminants were subject to the screening process, they are not all discussed in detail in the text. Contaminant concentrations that exceed the applicable screening criteria are summarized in this section of the report.

4.1.1 Selection of Site-Specific Screening Criteria

Regulatory standards and criteria were selected for each sampled matrix, and were approved by EPA. Whenever possible, established regulatory standards, known as chemical-specific applicable or relevant and appropriate requirements (ARARs), were used to screen data.

4.1.1.1 Groundwater Screening Criteria

Data from multi-port wells, existing monitoring wells, and Village of Garden City supply wells were screened against EPA's National Primary Drinking Water Maximum Contaminant Levels (MCLs), New York State Standards and Guidance Values for Class GA Groundwater (Human Water Source), and New York State Department of Health (NYSDOH) Drinking Water Quality Standards. In the case where more than one standard or criteria existed, the lowest, or most stringent, value was used as the site-specific groundwater screening criteria. Standards and guidance values exist for the majority of organic compounds; for inorganic analytes that do not have MCLs, background values were used to supplement regulatory guidances. In these cases, the background value is the higher of the contract-required quantitation limit (CRQL) for metals-AES method (if the background value was non-detect) or the average of the results from Round 1 and Round 2. Table 4-1a lists the groundwater screening criteria.

4.1.1.2 Soil Gas Screening Criteria

Soil gas screening criteria were selected from the EPA 2002 document titled "*Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and*

Soil". This document provides potential screening criteria for VOCs based on risk levels (e.g., 10^{-4}, 10^{-5} or 10^{-6}) and the depth of the sample. The site-specific soil gas screening criteria shown on Table 4-1b, were taken from Table 2c (risk of 10^{-6}) in the EPA guidance. The deep soil gas column was utilized, based on the depth of approximately 15 feet for the soil gas samples.

NYSDEC and NYSDOH have no subsurface soil vapor criteria (NYSDOH 2006).

4.1.2 Selection of Site-Related Contaminants

Selected site-related contaminants are used to focus the evaluation of the nature and extent of contamination in groundwater. To select the site-related contaminants, the analytical data collected during the RI were reviewed, the spatial distribution of contamination (focusing on groundwater) was evaluated and the historical site activities and investigations conducted at the site were reviewed. Based on these evaluations, five VOCs were selected as related to the site: PCE, TCE, 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1-2-DCE), and carbon tetrachloride. The rationale for selecting these five VOCs is discussed below.

- PCE and TCE were widely used during the 1940s for aircraft manufacturing, maintenance, and repair operations, although historical records do not document the amounts of waste PCE and TCE used or disposed at the Roosevelt Field airfield.

- Wells in the area have been historically contaminated with PCE, TCE, and associated degradation products since they were first sampled in the 1970s, including Village of Garden City supply wells GWP-10 and GWP-11, and the former cooling water well N-8050, located in the southern portion of the airfield (at 100 Ring Road). PCE levels in these wells reached 1,100 micrograms per liter (µg/L) (GWP-10 in the mid to late 1990s) and TCE levels reached 38,000 µg/L (N8050 in the mid-1980s). Further, the USGS investigation conducted in the 1980s documented three separate plumes of chlorinated VOCs (PCE, TCE, and associated degradation products) emanating from the Roosevelt Field area. 1,1-DCE and cis-1,2-DCE, are contaminants associated with the breakdown of PCE and TCE. Carbon tetrachloride was commonly used as a refrigerant and was likely associated with the cooling systems in the office buildings.

- PCE, TCE, 1,1-DCE, cis-1,2-DCE and carbon tetrachloride were the contaminants detected most frequently and at the highest levels in wells sampled during the RI groundwater investigation.

SVOCs, pesticides/polychlorinated biphenyls (PCBs), and inorganic analytes were not selected as site-related contaminants because of the limited number of detections, the infrequency of MCL exceedances, and, most importance, lack of evidence that any of these compounds or analytes were used during the period the site was used as an airfield.

4.1.3 Data Presentation

This report focuses only on VOC contamination of the five compounds determined to be site-related: PCE, TCE, 1,1-DCE, cis-1,2-DCE, and carbon tetrachloride. MCL exceedances of inorganic analytes are noted briefly at the end Sections 4.3.1.2 and 4.3.1.3.

Analytical data from RI sampling activities were entered into the site database for evaluation purposes, and were exported to an Environmental Geographic Information System (EGIS) for evaluation and graphical presentation. The data presented on the tables and figures in this section are in units consistent with Appendix K, and are as follows: organic and inorganic data for aqueous samples are presented in µg/L; soil gas screening data for total VOCs are presented in parts per billion per volume (ppbv), and soil gas data analyzed via Method TO-15 are presented in micrograms/cubic meter (µg/m^3). Aqueous wet chemistry parameters are presented in milligrams per liter (mg/L).

Some of the analytical results were qualified as estimated ("J" qualifier) during data validation. Data were estimated, and in some cases rejected, due to exceeded quality control criteria, including holding time exceedances and poor spike and surrogate recovery. The data that were estimated were determined to be usable. Rejected data were not used. A complete discussion of data validation, data usability, and data quality objectives (DQOs) is included in the Data Usability Report presented in Appendix L. It should be noted that all DQOs established in the work plan were met.

4.2 Background Groundwater Concentrations

Background groundwater samples were collected at the site from the upgradient multi-port well, SVP-1, located north of Old Country Road, for comparison with investigation samples. SVP-1 is located approximately 500 feet due north of the site, in an area unaffected by potential site disposal of contaminants. No other sources of groundwater contamination are located directly upgradient of the site. SVP-1 contains 10 sample ports to correspond with sample ports in downgradient multi-port wells. Background samples were analyzed for the same parameters as the investigation samples. Results from the upgradient well are used for comparison purposes only, with the exception of inorganic analytes that do not have national or state regulatory standards or guidance values. In these cases, the background value is calculated as described in Section 4.1.1.1.

4.3 Nature and Extent of Contamination

The following sections discuss the results and the nature and extent of groundwater and soil gas contamination at the Roosevelt Field site.

4.3.1 Groundwater Contamination

The following sections discuss VOC contamination in groundwater samples collected from the eight vertical profile borings and multi-port wells, nine existing monitoring wells, and two Village of Garden City supply wells.

4.3.1.1 Groundwater Screening Vertical Profile Results

Screening samples at 20-foot intervals at each SVP boring for VOC analysis with 24-hour turnaround time for results. Port locations for the multi-port wells were based on an evaluation of the screening results and were approved by EPA. In general, ports were placed in three zones in each multi-port well, as follows: at the top of the water table (approximately 50 feet bgs), at the top of the Magothy Formation (approximately 100 feet bgs), and at the deepest point in the boring (approximately 450 feet bgs). All other port locations were selected based on contaminant levels in each SVP.

During the groundwater screening survey, several VOCs were consistently detected, including TCE, PCE, 1,1-DCE, toluene, acetone, and dichlorofluoromethane. TCE, PCE, and 1,1-DCE are considered site-related VOCs, as discussed in Section 4.1.2. Toluene is likely related to gasoline spills from areas upgradient of the Roosevelt site, acetone may be a laboratory contaminant, and dichlorofluoromethane was used as a coolant. The highest levels of site-related VOCs were detected in SVP-4. Table 4-2 summarizes the detected VOCs during the screening survey at each SVP location.

Screening sample results from the SVPs are not fully comparable with multi-port well sample results due to differences in sample collection methods. Specifically, the multi-port well samples were collected from fully developed wells with appropriately-installed sand pack, whereas the screening samples were collected from a geoprobe screen with no sand pack and minimal development. The screening samples were collected through a 5-foot screened probe, while the multi-port well samples were collected from a port that monitors a very small (on the order of inches) portion of the aquifer. In addition, the screening and analytical samples were analyzed using different analytical methods.

4.3.1.2 Multi-Port Well Sample Results

Two rounds of VOC samples were collected from the eight multi-port monitoring wells. Results are presented in Tables 4-3 and 4-4. It should be noted that port 1 is at the bottom of each multi-port well, with the port numbers increasing as the ports get shallower in each well. The port number and depth for each multi-port well are included on Tables 4-3 and 4-4. Site-related VOC data by multi-port well location are summarized below. Exceedances of inorganic analytes are noted at the end of the section.

<u>SVP/GWM-1</u>

The majority of results in the upgradient background well were non-detect, although some low levels of gasoline-related VOCs were detected.

Several chlorinated solvents were detected in the deeper portions of the well, but at levels below the screening criteria values of 5 μg/L. The highest PCE levels were 0.38J μg/L and 0.8 μg/L during Rounds 1 and 2, respectively, and the highest TCE levels were 0.77 μg/L and 2.4 μg/L, respectively. The highest 1,1-DCE levels were 0.64 μg/L and 4 μg/L during the two rounds, respectively. Cis-1,2-DCE and carbon tetrachloride were not detected in any of the samples from SVP-GWM-1. Overall, the results in the

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upgradient background well were lower than those found in downgradient multi-port, existing monitoring, and Village of Garden City supply wells. These VOCs are the same as those found at the site; however, as they are upgradient from the site they are from source(s) other than the site.

Three other VOCs exceeded screening criteria in the upgradient well, as shown on Tables 4-3 and 4-4: trichlorofluoromethane, methyl-tert butyl ether (MTBE), and 1,1-dichloroethane (1,1-DCA). These VOC are not considered to be site-related because they were not known to be used when Roosevelt Field was an airfield.

<u>SVP/GWM-2</u>

SVP-GWM-2 is located near 100 Ring Road, near the former cooling water well N8050. Concentrations of site-related VOCs are much lower than historic levels in N-8050. PCE, TCE, and cis-1,2-DCE were detected at all depths in SVP/GWM-2, and exceeded screening criteria in several samples.

During Round 1, PCE ranged from 0.68 to 5.8 μg/L; the highest level, found in port 5, is the only concentration that exceeded the screening criterion. Round 2 PCE ranged from 0.14J to 4.4 μg/L, with no samples exceeding the screening criterion. In both rounds, TCE exceeded the screening criterion in all but the shallowest sample. Round 1 TCE ranged from 4.9 to 25 μg/L, and Round 2 levels ranged from 1 to 38J μg/L. Cis-1,2-DCE ranged from 0.29J to 8.4 μg/L during Round 1, with two samples exceeding the screening criterion. Round 2 levels ranged from 0.14J to 10 μg/L, with four samples in the middle portion of the well exceeding the screening criterion. The only detections of 1,1-DCE were very low, at 0.46J μg/L (port 2) and 0.41J μg/L (port 3), both during Round 1. Carbon tetrachloride was either non-detect or very low, with the highest concentrations at 0.14J μg/L (Round 1) and 0.03J μg/L (Round 2).

Three other VOCs exceeded screening criteria in SVP/GWM-3, as shown in Tables 4-3 and 4-4: dichlorodifluoromethane, trichlorofluoromethane, and 2-butanone. These VOC are not considered to be site-related because they were not known to be used when Roosevelt Field was an airfield.

<u>SVP/GWM-3</u>

SVP/GWM-3 is located in the Roosevelt Field Mall parking lot, east of the most contaminated multi-port well, SVP/GWM-4. In general, the highest levels of PCE are in the upper portion of the well, although they are below the screening criterion. The highest levels of TCE, some of which exceed the screening criterion, are found in the lower portions of the well. TCE is the only contaminant that exceeded screening criteria in SVP/GWM-2.

PCE ranged from 0.2J to 0.72 μg/L during Round 1 and from non-detect to 0.64 μg/L during Round 2. TCE during Round 1 and Round 2 ranged from non-detect to 8.9 μg/L (port 3) and 14 μg/L (port 2), respectively. 1,1-DCE ranged from non-detect to 0.84 μg/L (port 2) during Round 1. During Round 2, 1,1-DCE was only detected in the sample from port 2, at 1 μg/L. Cis-1,2-DCE ranged from non-detect to 0.39J μg/L in

Round 1 and to 0.8 μg/L in Round 2. Carbon tetrachloride was only detected during Round 2, at estimated levels below 1 μg/L in three samples.

Two other VOCs exceeded screening criteria in SVP/GWM-3, as shown in Tables 4-3 and 4-4: trichlorofluoromethane, and 1,1-DCA. These VOC are not considered to be site-related because they were not known to be used when Roosevelt Field was an airfield.

SVP/GWM-4

SVP/GWM-4 is located just west of 200 Garden City Plaza. It is the most contaminated well in the multi-port well network, with the bulk of contamination found in the middle portion of the well. With the exception of carbon tetrachloride, all site-related VOCs exceed screening criteria in this well.

During both rounds, PCE exceeded the screening criterion in all samples except the sample from the shallowest port (port 10). Round 1 levels ranged from 0.37 J μg/L in port 10 to 350 μg/L in port 6; Round 2 levels ranged from 0.31J in port 10 to 210 μg/L in port 3. TCE exceeded the screening criterion during both rounds in all but the two shallowest ports. Round 1 levels ranged from 1.3 to 280 μg/L (port 4); Round 2 levels ranged from 1.6 to 200 μg/L (port 4). Cis-1,2-DCE ranged from 0.1J to 5.3J μg/L during Round 1, with the highest level in port 6. Round 2 results ranged from 0.13J to 9.7 μg/L, with three samples exceeding the screening criterion. 1,1-DCE ranged from non-detect to 8.9 μg/L during Round 1 and to 9.7 μg/L during Round 2. Carbon tetrachloride ranged from non-detect to 1.3 μg/L during Round 1 and to 2.9 μg/L during Round 2.

Three other VOCs exceeded screening criteria in SVP/GWM-4, as shown in Tables 4-3 and 4-4: dichlorodifluoromethane, trichlorofluoromethane, and MTBE. These VOC are not considered to be site-related because they were not known to be used when Roosevelt Field was an airfield.

SVP-GWM-5

SVP/GWM-5 is located in Garden City Plaza, southeast of SVP/GWM-4. In general, higher levels of VOC contamination are found in the deeper half of SVP/GWM-5, specifically in port 2. TCE is the only site-related VOC that exceeded screening criteria in this well.

PCE ranged from 0.11J to 0.95 μg/L and from 0.11J to 0.92 μg/L in Rounds 1 and 2, respectively. TCE ranged from 0.11J to 32 μg/L and 0.19J to 28 μg/L, respectively. Cis-1,2-DCE ranged from non-detect during both rounds to 1.8 μg/L (Round 1) and to 2.9 μg/L (Round 2). 1,1-DCE ranged from non-detect to 2.8 μg/L during Round 1. During Round 2, 1,1-DCE was only detected in the sample from port 8 (1.4 μg/L).

Dichlorodifluoromethane, which is not site-related, exceeded its screening criterion in two samples during Round 1.

SVP-GWM-6

SVP/GWM-6 is located in a residential area on Meadow Street. This well was installed as one of two sentinel wells for the Hempstead well field. It is downgradient of the Roosevelt Field source area, and is also downgradient of two other contaminant sites (Pasley and Purex) in the area. TCE, 1,1-DCE and cis-1,2-DCE exceeded screening criteria in SVP/GWM-6. The highest levels were generally found in shallower zones of this well, with the highest levels in port 5. Since the contamination in the Roosevelt Field source area is concentrated in deeper zones than contamination is detected in this well, the contamination in SVP/GWM-6 may have originated from a source other than the Roosevelt Field site. In addition, several other VOCs that are not site-related (such as acetone and toluene) were also found in this well, at levels far exceeding screening criteria.

PCE ranged from non-detect during both rounds to 1.1 µg/L during Round 1 and 0.54 during Round 2. TCE ranged from 0.26J to 8.2 µg/L, with one sample exceeding the screening criterion during Round 1 and from non-detect to 2.5 µg/L during Round 2. 1,1-DCE ranged from 1.2 to 22 µg/L, with four samples exceeding the screening criterion, during Round 1 and from non-detect to 16 µg/L, with three samples exceeding the screening criterion during Round 2. Cis-1,2-DCE ranged from 0.26 to 22J µg/L during Round 1 and from non-detect to 17J µg/L during Round 2. Carbon tetrachloride was only detected during Round 2, at levels ranging from non-detect to 1 µg/L.

The following VOCs exceeded screening criteria in SVP/GWM-6: acetone, toluene, 1,1-DCA, 1,1,1-trichloroethane (1,1,1-TCA). The highest acetone concentration was 130 µg/L, and the highest toluene concentration was 810 µg/L. These VOC are not considered to be site-related because they were not known to be used when Roosevelt Field was an airfield.

SVP/GWM-7

SVP/GWM-7 is located in a residential area west of Commercial Avenue, along the former Long Island Railroad (LIRR) tracks. PCE, TCE, and 1,1-DCE exceeded screening criteria at this location, with most of the contamination concentrated in ports 2 and 3. However, this well contained the least amount and lowest concentrations of VOC contamination of all of the multi-port wells. It is likely this well is near the western extent of the contaminant plume associated with the Roosevelt site. This well was originally planned to be installed directly downgradient of the source area, and between the Village of Garden City supply wells and multi-port wells SVP/GWM-6 and SVP/GWM-8. However, access issues necessitated that the well be moved west.

The highest levels of PCE during Round 1 and 2 were 2.2 and 7.7 µg/L, respectively. The highest levels of TCE during both rounds were 9.4 and 20 µg/L, respectively. The highest levels of 1,1-DCE were 1.4 and 5.2 µg/L, respectively. The highest levels of cis-1,2-DCE were 1 and 3.9 µg/L, respectively. Carbon tetrachloride was not detected in any of the samples from this well.

No other VOCs exceeded screening criteria during either round of sampling.

SVP/GWM-8

SVP/GWM-8 is the furthest downgradient multi-port well from the Roosevelt Field source area, located in a residential area on the corner of Clinton Road and Meadow Street. This well was installed as the main sentinel well for the Hempstead well field. It is located one block north (upgradient) of the Hempstead well field, in a residential area on the corner of Clinton Road and Meadow Street. It is due west of SVP-GWM-6, and similarly to that well, is also downgradient of two other contaminant sites in the area. PCE is the only site-related VOC that exceeded the screening criteria in this well. The highest levels were found in shallower zones of this well, specifically in port 5. As in SVP/GWM-6, the contamination in SVP/GWM-8 may have originated from a source other than the Roosevelt Field site.

Round 1 PCE ranged from 0.92 to 34 µg/L, with three of the six samples exceeding screening criteria. Round 2 levels ranged from 0.35J to 57 µg/L, with all but the shallowest sample exceeding screening criteria. TCE was detected during both rounds, in all but the shallowest sample; the highest concentrations during Round 1 and 2 were 1.9 and 3.2 µg/L, respectively. Cis-1,2-DCE was only detected in three samples, at very low estimated levels, during each round. 1,1-DCE and carbon tetrachloride were not detected in any samples at this well.

No other VOCs exceeded screening criteria during either round of sampling.

Inorganic Analyte Exceedances

Samples from seven multi-port wells were analyzed for inorganic analytes. During Round 1, three analytes exceeded MCLs, including aluminum (SVP-1, the background well), iron (SVP-1 and SVP-6), and manganese (SVP-4). During Round 2, iron and manganese exceeded their screening criteria, at the same wells as Round 1.

4.3.1.3 Existing Monitoring Well and Supply Well Sample Results

Two rounds of VOC data were collected from nine existing monitoring wells and two Village of Garden City supply wells, concurrent with the sampling at the multi-port wells. Results are presented in Tables 4-5 and 4-6 and discussed below. Well locations are shown on Figure 2-1a.

Four of the existing wells are completed in the shallow portion of the aquifer in the Upper Glacial deposits. The total depths of these wells range from 22 to 53 feet bgs. Shallow existing wells include: GWX-9953 (located in Hazelhurst Park, east of SVP/GWM-2); GWX-9966 (located adjacent to Pembrook Basin southwest of the Roosevelt Field Mall); GWX-10035 (located downgradient of the Roosevelt Field source area, east of SVP/GWM-7 on the corner of Commercial Avenue and Clinton Road); and GWX-9398 (located further downgradient, just west of SVP/GWM-8, on the corner of Meadow Street and Clinton Road).

The remaining five existing wells and the two Village of Garden City supply wells are completed in the Magothy Formation, with total depths ranging from 190 to 556 feet bgs. The existing Magothy wells include: GWX-10019 (223-228 feet bgs), located west of SVP/GWM-5; GWX-10020 (185-190 feet bgs), located on the southern side of the

Garden City Plaza parking lot, adjacent to Ring Road; GWX-8068 (265-291 feet bgs), located in the office building at 585 Stewart Avenue, near the southern mall entrance; and GWX-8474 (485-556 feet bgs) and GWX-8475 (409-481 feet bgs), both located inside a pump house on Oak Street, west of SVP/GWM-6.

GWX-10019

TCE was detected in Rounds 1 and 2 at 260 µg/L and 170 µg/L, respectively and cis-1,2-DCE was detected at 21 µg/L and 23 µg/L, respectively. PCE was detected at 2 µg/L and 2.2 µg/L during Rounds 1 and 2, respectively. Carbon tetrachloride was very low, at 0.2J and 0.28J, respectively. 1,1-DCE was not detected in GWX-10019.

The VOC MTBE, which is not site-related, was also detected during both rounds in GWX-10019, at levels exceeding the screening criterion.

GWX-10020

Site-related VOCs were detected in GWX-10020 at levels below screening criteria. Results include: PCE at 1.3 µg/L (Round 1); TCE at 1.6 µg/L (Round 1) and 0.14J µg/L (Round 2); and cis-1,2-DCE at 0.19J µg/L. 1,1-DCE and carbon tetrachloride were not detected in GWX-10020.

No other VOCs exceeded screening criteria.

GWX-8068

GWX-8086 was only sampled during Round 2, due to access issues during Round 1. This well also contained high levels of site-related VOCs, with all but carbon tetrachloride results exceeding screening criteria. Results during Round 2 include: PCE at 170 µg/L, TCE at 54 µg/L, 1,1-DCE at 17 µg/L, cis-1,2-DCE at 5.3J µg/L, and carbon tetrachloride at 0.44J µg/L. It should be noted that this well is not within the direct flow path of the SVP-4 contamination.

The VOC 1,1,2-trichloro-1,2,2-trifluoroethane, which is not site-related, was detected slightly above the screening criterion.

GWX-8474 and GWX-8475

The five site-related VOCs were detected in GWX-8474 during Round 1. PCE and TCE exceeded screening criteria during both rounds; 1,1-DCE exceeded screening criteria during round 2. PCE and TCE were detected at 5.8 and 29 µg/L during Round 1 and at 6.3 and 25 µg/L during Round 2. 1,1-DCE and carbon tetrachloride were detected only during Round 2, at 7.4 and 0.42J µg/L, respectively. Cis-1,2-DCE was detected during both rounds, at 0.76 and 1.4J µg/L, respectively.

PCE, TCE, and 1,1-DCE exceeded screening criteria in GWX-8475. PCE was detected at 5.5 µg/L (Round 1) and 3.7 µg/L (Round 2). TCE was detected at 24 µg/L and 16 µg/L during Rounds 1 and 2, respectively. 1,1-DCE was detected at 17 and 20J µg/L, respectively. Cis-1,2-DCE was detected at 1.2 and 0.79J µg/L, respectively. Carbon tetrachloride was not detected in GWX-8475.

Several other non-site-related VOCs were also detected in existing wells GWX-8474 and GWX-8475, such as 1,1,2-trichloro-1,2,2-trifluoroethane (at levels exceeding screening criteria), 1,1-DCA, 1,1,1-TCA, and 1,1,2-TCA. The contamination in these wells may have originated from sources other than those at Roosevelt Field since several non-site-related VOCs were detected in these wells, and the wells are located downgradient of other contaminant sources.

<u>GWP-10 and GWP-11</u>

Village of Garden City supply wells GWP-10 and GWP-11 have historically contained high levels of site-related contaminants since they were first sampled in the 1970s, although levels have shown a decreasing trend since the mid-1990s. All five site-related VOCs were detected in the two Village of Garden City supply wells, with many levels exceeding screening criteria. In general, higher levels were found in GWP-10 than in GWP-11.

Concentrations of site-related VOCs in GWP-10 during Round 1 and Round 2, respectively, were as follows: PCE at 270 and 230 μg/L; TCE at 170 and 220 μg/L; 1,1-DCE at 5.5 and 12 μg/L; cis-1,2-DCE at 13 and 26J μg/L; and carbon tetrachloride at 0.85 and 1.2 μg/L.

Concentrations of site-related VOCs in GWP-11 during Round 1 and Round 2, respectively, were as follows: PCE at 50 and 58 μg/L; TCE at 160 μg/L during both rounds; 1,1-DCE at 4 and 3.7 μg/L; cis-1,2-DCE at 13 and 10 μg/L, and carbon tetrachloride at 0.42J and 0.46J μg/L. Duplicate results were similar to those in GWP-11.

<u>Inorganic Analyte Exceedances</u>

At the existing and Village of Garden City supply wells, three inorganic analytes exceeded screening criteria in Round 1, including iron (in five wells), manganese (in two wells), and lead (in two wells, GWX-10019 and GWX-10020, at 25 and 27 μg/L, respectively). In Round 2, copper (at well GWX-8068), iron (five wells), and lead (at GWX-8068 at 21.9 μg/L) exceeded the screening criteria.

4.3.1.4 Evaluation of Groundwater Contamination

The results from both rounds of groundwater samples collected during the RI were used to prepare figures and cross sections to illustrate the extent of the two main contaminants, PCE and TCE, in groundwater. Figure 4-1 shows an aerial view of all sampled wells and presents the highest concentrations of PCE and TCE at each well during Round 1. PCE and TCE were selected for the figures because these two compounds are detected the most frequently, and with the highest concentrations. As shown on this figure, the highest levels of PCE and TCE (350 and 280 μg/L, respectively) are concentrated at SVP/GWM-4, at elevations ranging from approximately -221 to -156 feet below msl (approximately 250 to 310 feet bgs). It should be noted that the SVP-4 location was selected for monitoring because a distilling well/drain field was operated in the area during the 1980s, to dispose of cooling water contaminated with the site-related VOCs. The next highest levels occur downgradient (to the south) of SVP/GWM-4 in existing well GWX-10019, at a slightly shallower depth, and at the two Village of Garden City supply wells GWP-10 and GWP-11, approximately 150 feet deeper than the highest contaminant zone in SVP/GWM-4. These four wells comprise the core of the PCE/TCE contaminant plume.

GWP-10 and GWP-11 each have a capacity to pump approximately one mgd of groundwater from the Magothy aquifer (with the wells pumping alternately), and as a result, have a direct influence on the localized groundwater flow and corresponding contaminant plume. Pumping has limited the downgradient migration of contamination. This scenario is illustrated in a cross section presented as Figure 4-2; the cross-section location is shown on Figure 4-1. As illustrated in Figure 4-2, groundwater flow and contaminant movement is downward and south from contaminant sources to active pumping well GWP-10. A slight groundwater depression visible in the vicinity of SVP/GWM-2 and SVP/GWM-4 may be a result of pumping at the Village of Garden City supply wells. Limited site-related contamination is observed in the sentinel wells south (downgradient) of these supply wells. Very little site-related contamination is allowed to continue migrating south of the Village of Garden City supply wells, as evidenced by their high pumping volume, and by the fact that there is little contamination found in the deeper portion of the sentinel wells.

Round 2 data are presented in Figures 4-3 and 4-4. Round 2 data show the same general trends in contaminant location and movement. In addition, isoconcentration contour maps were prepared to illustrate the general extent of TCE and PCE plumes at various depths in the aquifer. Figures 4-5 and 4-6 depict the Round 1 isocontours for PCE and TCE, respectively.

Further downgradient of the active pumping well(s), PCE and TCE contaminant levels in the most downgradient multi-port well (SVP/GWM-8) are seen at shallower depths than at the plume core in the source area. Two sources of VOC contamination (Pasley and Purex) are in the area south of the Roosevelt site. Given the shallower depth of contamination at the downgradient wells in the residential area, the presence of VOCs not associated with sources at the Roosevelt Field site, the presence of other VOC sources upgradient of these wells, and the fact that the Village of Garden City supply wells have limited the southward migration of contamination associated with the Roosevelt site, the contamination at the downgradient wells is likely to be related other sources of groundwater contamination. Groundwater contamination from the Roosevelt site may have migrated beyond the two Village of Garden City supply wells in the years between about 1940 and 1953 when the wells began pumping. However, contamination that may have moved further south than these wells would likely have been drawn into the radial cone of influence created by the large volume of water withdrawn from these wells on a continuing basis.

Concentrations of the site-related VOCs are not indicative of the presence of non-aqueous phase liquid (DNAPL) contamination.

Very deep groundwater contamination (TCE at 10.1 µg/L) was recently detected in one of the Village of Hempstead supply wells, located just south (downgradient) of multi-port monitoring wells SVP/GWM-6 and SVP/GWM-8 (see Figure 2-1b). The source of this contamination is currently unknown, as several potential sources are located upgradient of the Hempstead well field.

4.3.2 Soil Gas Survey Results

Two types of soil gas samples are discussed in the sections below. Soil gas screening samples (summarized in Section 4.3.2.1) were collected at the nodes of a 100-foot by 100-foot grid from 158 locations in a large portion of the paved and unpaved areas of the site bordering Old Country Road and Clinton Road (Figures 2-3, 4-7, and 4-8). Measurements of total VOCs were made with a ppbRae instrument at two depths at each location (approximately 15 and 35 feet bgs). Soil gas samples (summarized in Section 4.3.2.2) were collected in Summa canisters, from depths of 15 feet bgs at 30 locations adjacent to buildings 100 and 200 in the Garden City Plaza office complex, and at 100 Ring Road. In addition, six canister samples (from four different locations) were collected from Hazelhurst Park (the grassy strip along Clinton Road) where the screening survey results were elevated.

4.3.2.1 Soil Gas Screening Results

Soil gas screening results from approximately 15 feet bgs and 35 feet bgs are summarized below and on Figures 4-7 and 4-8 and on Table 4-7.

<u>15 Feet bgs</u>

Five of the samples collected at approximately 15 feet bgs had total VOC readings above 100 ppbv.

- Location A0 - This location is at the corner of Old Country Road and Clinton Road. The total VOC reading was 106 ppbv.
- Location A11 - This location borders Clinton Road in Hazelhurst Park. The total VOC reading was 136 ppbv. Canister samples SGHP2 and SGHP4 were collected near this location.
- Location D17 - This location is just west of Garden City Plaza Building 100. The total VOC reading was 531 ppbv. Canister sample SGRF30 was collected near this location.
- Location D19 - This location is west of Garden City Plaza Building 200. The total VOC reading was 534 ppbv.
- Location F20 - This location is south of Garden City Plaza Building 200. The total VOC reading was 163 ppbv. Canister sample SGRF32 was collected near this location.

Of the soil gas readings collected at approximately 15 feet bgs, 85 percent were at or below 10 ppbv; 8 percent were between 11 and 50 ppbv, and 4 percent were between 51 and 100 ppbv.

35 Feet bgs

Nine of the samples collected at approximately 35 feet bgs had total VOC readings above 100 ppbv, as described below.

- Locations A9, A10, and A11 - These locations border Clinton Road in Hazelhurst Park. The total VOC readings were 245 ppbv, 233 ppbv, and 148 ppbv, respectively. Canister samples SGHP1, SGHP2, and SGHP3 were collected near these locations.
- Location B15 - This location is west of the northwest corner of Garden City Plaza Building 100. The total VOC reading was 368 ppbv.
- Location C20 - This location is one of the southern-most samples. The total VOC reading was 112 ppbv.
- Location D17 - This location is just west of Garden City Plaza Building 100. The total VOC reading was 494 ppbv. Canister sample SGRF30 was collected near this location.
- Location E14 - This location is north of the northeast corner of Garden City Plaza Building 100. The total VOC reading was 211 ppbv.
- Location H1 - This location is southeast of the Citibank building, near the entrance road to the mall. The total VOC reading was 152 ppbv.
- Location K0 - This location is on the eastern side of the mall entrance road. The total VOC reading was 185 ppbv.

Of the soil gas readings collected at approximately 35 feet bgs, 83 percent were at or below 10 ppbv; 9 percent were between 11 and 50 ppbv, and 2.5 percent were between 51 and 100 ppbv.

4.3.2.2 Soil Gas Analytical Results

Soil gas samples collected in canisters and analyzed by the TO-15 method were compared to the soil gas screening criteria. All detected compounds are shown on Table 4-8. Detections of site-related VOCs are shown on Figure 4-9. The results are summarized below.

TCE detections exceeded the screening criterion of 2.2 $\mu g/m^3$ in one sample near Garden City Plaza building 200 (SGRF-25 at 23 $\mu g/m^3$). Three samples collected along Hazelhurst Park (adjacent to Clinton Road) had TCE detections that exceeded the criterion (SGHP-2 at 3.9J, SGHP-3 at 12, and SGHP-4 at 3J $\mu g/m^3$). It should be noted that the contract required detection limit for TCE exceeded the screening criterion; it ranged from 5.2 to 5.8 $\mu g/m^3$. However, the laboratory reported positive detections below the contract required limit and above the instrument detection limit. For example, in sample SGRF-17, TCE was detected at 1.5 J $\mu g/m^3$. EPA recently collected additional vapor samples on the west side of Clinton Road. The results can be found in a separate document in the administrative record for the site.

The VOC 1,3-butadiene, with a screening criterion of 0.87 $\mu g/m^3$, was detected in five samples (SGRF-17, SGRF-19, SGRF-20, SGRF-21, and SGRF-22) near the office buildings, ranging from 2.4 J to 9.9 J $\mu g/m^3$. This VOC is not considered to be site-related.

Numerous other VOCs were detected at very low levels in the soil gas samples collected near the buildings and along Hazelhurst Park. None exceeded the screening criteria and most are associated with gasoline.

Prior to collection of the summa canister samples, VOC readings were taken with the ppbRAE. The results ranged from non-detect to 3 ppbv. Three borehole locations had VOC readings out of this range: SGRF32 at 62 ppbv, SGRF27 at 451 ppbv, and SGRF30 at 151 ppbv. It should be noted that none of these three canister samples had detections of site-related VOCs.

No residual source areas that could continue to contaminate groundwater were found in the unsaturated zone by the extensive soil gas survey. EPA recently collected soil samples to confirm that no residual source areas are present. The results of the soil sampling effort can be found in a separate document in the administrative record.

4.4 Comparison of Groundwater and Soil Gas Detections

The best location to compare detections in groundwater and soil gas canister samples is at existing well 9953 (screened at 35-40 feet bgs) and SVP-4 port 10 (at 45-50 feet bgs). Well 9953 is located in Hazelhurst Park, between soil gas locations SGHP2/SGHP4 and SVHP1. SVP-4 is approximately 350 feet south of SGHP1, on the eastern side of the line of trees that separate Hazelhurst Park and Garden City Plaza.

The following VOCs were detected in the well/port, with Round 1 results listed first, followed by Round 2.

- Well 9953 - acetone (2.3 J μg/L and non-detect), MTBE (4.2 μg/L and 5.3 μg/L), and methylene chloride (non-detect and 2.2 μg/L)
- SVP-4 Port 10 - PCE (0.37 μg/L and 0.31J μg/L), TCE (1.3 μg/L and 1.6 μg/L), cis-1,2-DCE (0.1 μg/L and 0.13J μg/L), and dibromochloromethane (non-detect and 0.47J μg/L)

The following VOCs were detected in the soil gas analytical samples collected in Hazelhurst Park: PCE, TCE, cis-1,2-DCE, ethanol, isopropyl alcohol, 1,3-butadiene, carbon disulfide, 1,1,2-trichloro-1,2,2-trifluoroethane, acetone, methylene chloride, hexane, 1,1-DCA, 2-butanone, chloroform, 1,1,1-TCA, cyclohexane, 2,2,4-trimethylpentane, benzene, n-heptane, toluene, ethylbenzene, m-xylene, o-xylene, 1,2,4-trimethylbenzene.

The following VOCs were detected in both the groundwater at the top of the water table and the soil gas samples in Hazelhurst Park: PCE, TCE, and cis-1,2-DCE.

The following VOCs were detected in groundwater but not in soil gas in Hazelhurst Park: MTBE and dibromochloromethane.

The following VOCs were detected in soil gas but not in groundwater, at levels shown in Table 4-8: ethanol, isopropyl alcohol, 1,3 butadiene, carbon disulfide, 1,1,2-trichloro-

1,2,2-trifluoroethane, hexane, 1,1-DCA, 2-butanone, chloroform, 1,1,1-trichloroethane, cyclohexane, 2,2,4-trimethylpentane, benzene, n-heptane, toluene, ethylbenzene, m-xylene, o-xylene, 1,2,4-trimethylbenzene.

The comparison of VOCs detected at the top of the water table in the groundwater samples in or nearest to Hazelhurst Park indicate that groundwater is not a likely source of the VOCs detected in the soil gas samples. Most of the soil gas VOCs are related to gasoline. The source of the chlorinated VOCs (e.g., TCE, PCE, and cis-1,2-DCE) in the soil gas is unknown. A review of historical aerial photos from the 1930s and 1940s indicates that the location of Clinton Road has not changed over the years. The airfield buildings faced the street, with lawns and occasional shrubs fronting the buildings on the street side. There is no evidence of airplane use in the area that is now Hazelhurst Park. All airplanes were parked (and presumably maintained) on the sides of the buildings that faced away from the street, closer to the runways. It is highly unlikely spent solvents were disposed of in the landscaped areas in the front of the buildings along Clinton Road.

5

Section Five

Section 5
Contaminant Fate and Transport

This section examines the chemical and physical processes that affect the fate and transport of contaminants in groundwater and soil gas at the site. The focus is on the five site-related VOCs, which are described in Section 4. An understanding of the fate and transport of contaminants aids the evaluation of potential current and future exposure risks and with the evaluation of remedial technologies in the feasibility study. This section provides the following:

- A listing of the site-related VOCs
- A summary of the relevant physical-chemical and mobility-related properties of the site-related VOCs
- A discussion of processes that affect the fate of the site-related VOCs in the environment
- A discussion of processes that affect transport potential of the site-related VOCs
- A discussion of properties of site media
- A presentation of the conceptual site model
- A summary of the fate and transport evaluation

5.1 Contaminants

Groundwater is the primary environmental medium of concern and the major contaminant types were VOCs. VOCs in groundwater are in a dissolved state; no evidence of DNAPL was observed. Soil gas results indicated numerous VOCs were present at low levels, primarily gasoline-related VOCs.

5.1.1 Site-Related VOCs

In groundwater, the site-related VOCs include PCE, TCE, 1,1-DCE, cis-1,2-DCE and carbon tetrachloride. These contaminants were detected historically in the Roosevelt Field Mall area (Eckhardt and Pearsall 1989) and at the two Village of Garden City supply wells.

The site-related VOCs for soil gas are the same as those for groundwater. Site-related VOCs were detected in a limited number of soil gas samples. Most of the VOCs detected in the soil gas samples are gasoline related. These gasoline-related contaminants will not be addressed in this section.

5.2 Chemical and Physical Properties of Site-Related VOCs

To predict the fate, or persistence, and potential transport of the site-related VOCs detected in groundwater, it is necessary to identify which contaminants are likely to migrate or degrade. These processes depend on a given chemical's physical and chemical properties and the properties of the media through which it migrates. Table 5-1 presents the chemical and physical properties of these contaminants. The properties are defined in the following paragraphs and discussed in the next section.

The solubility of a chemical is defined as the upper limit of its dissolved concentration in water at a specified temperature. Concentrations in excess of solubility may indicate sorption onto soils, a co-solvent effect, or the presence of a non-aqueous phase liquid. As shown in Table 5-1, the five site-related VOCs have relatively high water solubility, ranging from 0.15 (PCE) to 3.5 μg/L (cis-1,2-DCE).

Vapor pressure is the pressure exerted by a chemical vapor, at any given temperature, in equilibrium with its solid or liquid form. It is used to calculate the rate of volatilization of a pure substance from a surface or to estimate a Henry's Law constant for chemicals with low water solubility. The higher the vapor pressure, the more likely a chemical is to exist in a gaseous state. At the Roosevelt site, the site-related VOCs have relatively high vapor pressure, ranging from 18 (PCE) to 600 (1,1-DCE) millimeters (mm) of mercury (Hg), which indicates that these VOCs will evaporate rapidly from the near-surface soil.

Henry's Law constant provides a measure of the extent of chemical partitioning between air and water at equilibrium. The higher the Henry's Law constant, the more likely a chemical is to volatilize. At the site, all of the five VOCs have Henry's Law constants greater than 10^{-3} atmosphere-cubic meters per mole (atm-m^3/mol), which indicates they will volatilize from water.

The organic carbon partition coefficient (K_{oc}) provides a measure of the extent of chemical partitioning between organic carbon and water at equilibrium. The higher the K_{oc}, the more likely a chemical is to bind to soil or sediment rather than to remain dissolved in water. At the site, the range of K_{oc} for site-related VOCs is from 65 mL/g (1,1-DCE) to 360 mL/g (PCE), which indicates that these VOCs are less likely to bind to soil and are highly mobile in water.

The soil-water partition coefficient (K_d) provides a soil- or sediment-specific measure of the extent of chemical partitioning between soil or sediment and water, adjusted for dependence upon organic carbon. K_d is adjusted using the fraction of organic carbon (f_{oc}) of the soil/sediment as shown in the formula $K_d = K_{oc} \times f_{oc}$. A higher K_d, indicates that a chemical is more likely to bind to soil or sediment rather than to remain in the dissolved phase, thereby reducing its transport capability. K_d values were calculated for site-related VOCs (Table 5-1) using the NYSDEC generic total organic carbon value (0.00020 mg/kg) because no soil samples were collected. The adsorptions of site-related VOCs for K_d values, based on the assigned f_{oc} are similar to those derived using K_{oc} values, indicating the site-related VOCs show low adsorption potential.

The octanol-water partition coefficient (K_{OW}) provides a measure of the extent of chemical partitioning between water and octanol at equilibrium. The greater the K_{OW}, the more likely a chemical is to partition to octanol rather than to remain in water. Octanol is used as a surrogate for lipids, and K_{OW} is used to predict bioconcentration in living organisms. At the site, all five VOCs have relatively low K_{OW} indicating that they have low potential to bioconcentrate in living organisms.

5.3 Environmental Fate of Contaminants

Contaminant fate describes the length of time a contaminant will remain in its original chemical state in the environment.

5.3.1 Processes that Affect Fate

The major processes that affect the fate, or persistence, of the site-related VOCs are volatilization, biodegradation, dissolution, and hydrolysis. The most persistent chemicals are those that do not volatilize, biodegrade, dissolve or hydrolize.

Volatilization - Volatilization is the conversion of a liquid or solid to a gas or vapor by application of heat, by reducing pressure, by chemical reaction, or by a combination of these processes. A chemical's volatility is measured with the Henry's Law constant and vapor pressure.

Biodegradation - Biodegradation is the breakdown of organic contaminants by microbial organisms into smaller compounds. The microbial organisms transform the contaminants through metabolic or enzymatic processes. Biodegradation processes vary greatly, but frequently the final product of the degradation is carbon dioxide or methane. Biodegradation can occur under aerobic conditions, where oxygen is present in sufficient concentration, or under anaerobic conditions, where oxygen is lacking.

Dissolution - Dissolution is the process of dissolving, changing, or separating a substance into component parts or changing it from a solid to a fluid state. Mechanisms that cause or enhance dissolution include solution by heat, moisture liquefaction, melting, or decomposition.

Hydrolysis - Hydrolysis is a chemical decomposition process that uses water to split chemical bonds of substances. There are two types of hydrolysis, acidic and enzymatic. Hydrolysis occurs in certain inorganic salts in solution, in nearly all non-metallic chlorides, in esters, and in other organic substances.

5.3.2 Fate of Chlorinated VOCs

The fate of VOCs is dominated by their volatility and degradation. Five site-related VOCs were detected in groundwater. Their fate is discussed below.

PCE - In the atmosphere, PCE is expected to be present primarily in the vapor phase and not sorbed to particulates because of its high vapor pressure of 18 mm Hg. Vapor-phase PCE will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals. Direct photolysis is not expected to be an important environmental fate process since PCE only absorbs light weakly in the environmental ultraviolet (UV) spectrum (HSDB 2005).

The dominant fate of PCE in soils is volatilization. Based on its K_{oc} value, PCE is moderately mobile in soils. Consequently, PCE has the potential to migrate through the soil into groundwater. Biodegradation under anaerobic conditions in soil and groundwater may occur at a relatively slow rate. The half-lives in soil and groundwater were reported to be 180-360 days and 270 days respectively (HSDB 2005).

In groundwater samples, PCE was detected in all levels of multi-port wells SVP-2 through SVP-5 in the mall area, with the highest detections in SVP-4 (maximum of 350 μg/L at 245 to 250 feet bgs). PCE was detected at levels below the MCL in two of the downgradient multi-port wells (SVP-6 and SVP-7) and slightly above the MCL in SVP-8 (34 to 15 μg/L in the zone from 100 to 240 feet bgs). PCE has been detected in the two Village of Garden City supply wells since the mid-1980s, when sampling began. PCE levels peaked in 1998 at 1,100 μg/L. PCE was at 270 μg/L in pumping well 10 in April 2006. PCE was detected at levels below the MCL in the background well, in the four deepest ports, from 290 to 405 feet bgs. Natural attenuation of PCE is discussed in Section 5.5.

In soil gas samples, PCE was detected in one sample (SGRF-17) at 2.3 J $\mu g/m^3$, adjacent to Building 200, and in four samples from Hazelhurst Park (the grassy strip along Clinton Road), ranging from 11 to 23 $\mu g/m^3$.

TCE - In the atmosphere, TCE is expected to be present primarily in the vapor phase rather than sorbed to particulates because of its high vapor pressure. Some removal during wet precipitation is expected because of the moderate solubility of TCE in water. The major degradation process affecting vapor phase TCE is photo-oxidation by hydroxyl radicals; the half-life for this reaction in air is estimated to be seven days (HSDB 2005).

The dominant fate of TCE in surface soils is volatilization. Because of its moderate to high mobility in soils, TCE has the potential to migrate through the soil into groundwater. Biodegradation in soil and groundwater may occur at a relatively slow rate with half-lives on order of months to a year (Lucius *et al.* 1990).

TCE is resistant to aerobic biodegradation. Under anaerobic conditions, as might be seen in aquifers, TCE slowly biodegrades via reductive dechlorination; however, the extent and rate of degradation are dependent upon the strength of the reducing environment (HSDB 2005). TCE's ability to bioconcentrate or to sorp to suspended solids and sediments is not significant.

In groundwater samples, TCE was detected in most levels of multi-port wells SVP-2 through SVP-5 in the mall area, with the highest detections in SVP-4 (maximum of 280 μg/L at 305 to 310 feet bgs). TCE was detected in the three downgradient multi-port wells, primarily at levels below the MCL. The MCL was exceeded in SVP-6 (8.2 μg/L at 245-250 feet bgs) and in SVP-7 (9.4 μg/L at 310-315 feet bgs). TCE has been detected in the two Village of Garden City supply wells since the mid-1980s, when sampling began. TCE levels peaked in 1996 at 1,400 μg/L. TCE was at 170 μg/L in pumping well 10 in April 2006. TCE was detected at levels below the MCL in the background well, in the five deepest ports, from 250 to 405 feet bgs. Natural attenuation of TCE is discussed in Section 5.5.

In soil gas samples, TCE was detected in sample SGRF-17 at 1.5 J μg/m^3 (adjacent to Building 200), in sample SGRF-25 at 23 μg/m^3 (adjacent to Building 200) and in three samples from Hazelhurst Park (the grassy strip along Clinton Road), ranging from 3 J to 12 μg/m^3.

<u>1,1-DCE</u> - 1,1-DCE is a breakdown product of PCE and TCE. The dominant fate of 1,1-DCE in soil is volatilization based on its high vapor pressure. 1,1-DCE is not expected to adsorb to suspended solids and sediment in water and will have high mobility in soil; thus, 1,1-DCE has the potential to migrate through the soil into groundwater.

The dominant fate of 1,1-DCE in surface water is volatilization based on its Henry's Law constant. Biodegradation and adsorption onto particulate matter are not significant relative to volatilization. The reported half-life of 1,1-DCE in soil and in groundwater is 28 - 180 days and 180 to 270 days, respectively (HSDB 2004). The potential of 1,1-DCE to bioconcentrate in aquatic organisms is relatively low.

In groundwater samples, 1,1-DCE was detected frequently in multi-port wells SVP-2 through 6, at levels below the MCL. The MCL was exceeded in two wells: SVP-4 (5.5 J to 8.9 μg/L from 245 to 310 feet bgs) and SVP-6 (22 to 6.6 μg/L at 100 to 445 feet bgs). 1,1-DCE was detected below the MCL in the lowest two ports in SVP-7 and was not detected in SVP-8. 1,1-DCE was detected just above the MCL in one of the Village of Garden City supply wells. 1,1-DCE was detected below the MCL in six ports in the background well, SVP-1. Natural attenuation of 1,1-DCE is discussed in Section 5.5.

1,1-DCE was not detected in soil gas samples.

<u>*Cis*-1,2-DCE</u> - Cis-1,2-DCE is a breakdown product of PCE and TCE. The dominant fate process of *cis*-1,2-DCE in soil and water is volatilization, because of its high vapor pressure and Henry's Law constant. The compound *Cis*-1,2-DCE will leach rapidly through sandy soil into groundwater. Significant biodegradation in soil or groundwater is not expected (Howard 1990). Chemical and biological degradation of *cis*-1,2-DCE is expected to be very slow. Adsorption to sediment or soil, hydrolysis, and bioconcentration in aquatic organisms are not expected to be significant.

Based on its K_{oc} value, little adsorption to soil and high mobility in soil is expected for *cis*-1,2-DCE. Without significant adsorption to soil, *cis*-1,2-DCE can leach into groundwater where very slow biodegradation should occur (HSDB 2005). The presence of cis-1,2-DCE in groundwater, especially under sandy soil (Barber *et al.* 1988), substantiates its leachability. The relatively low Koc and high vapor pressure of *cis*-1,2-DCE indicate that this compound should also readily volatilize from moist soil surfaces (HSDB 2005, ATSDR 1996). The compound *cis*- 1,2-DCE undergoes slow reductive dechlorination under anaerobic conditions (Fogel *et al.* 1986, ATSDR 1996).

In groundwater samples, *cis*-1,2-DCE was detected frequently in multi-port wells SVP-2 through 6, at levels below the MCL. The MCL was exceeded in wells: SVP-2 (9.4 μg/L at 250 feet bgs and 5.2 μg/L at 330 feet bgs), SVP-4 (5.3 J μg/L at 245 feet bgs) and SVP-6 (22 μg/L at 100 feet bgs). *Cis*-1,2-DCE was detected below the MCL in one port in SVP-7 and in three ports in SVP-8. *Cis*-1,2-DCE was detected above the MCL (13 μg/L) in the two Village of Garden City supply wells. *Cis*-1,2-DCE was not detected in the background well, SVP-1.

In soil gas samples, *cis*-1,2-DCE was not detected in any samples around the three buildings. It was detected in two samples from Hazelhurst Park (the grassy strip along Clinton Road), at 2.5 J and 6.5 $\mu g/m^3$.

Carbon Tetrachloride - Carbon tetrachloride is a manufactured chemical that does not occur naturally. It is a clear liquid with a sweet smell that can be detected at low levels and is most often found in the air as a colorless gas. It is not flammable and does not dissolve in water very easily. It moves very quickly into the air, as predicted by its vapor pressure and Henry's Law constant. Carbon tetrachloride evaporates quickly from surface water and only a small amount adsorbs to soil particles; the rest evaporates or moves into the groundwater. The compound does not bioconcentrate in animals. It should be noted that carbon tetrachloride was widely used with refrigerants in the years the cooling water wells were active.

In groundwater samples, carbon tetrachloride was detected frequently in multi-port wells SVP-2 through 5 in the Roosevelt Field mall area and in the two supply wells, at levels below the MCL and less than 1 μg/L. Carbon tetrachloride was not detected in the three downgradient wells (SVP-6 through SVP-8). It was not detected in the background well, SVP-1.

Carbon tetrachloride was not detected in the soil gas samples.

5.4 Contaminant Transport

Potential migration/exposure mechanisms that impact contaminant transport for chemicals in groundwater or soil gas at the site are discussed below.

Groundwater Discharge to Surface Water

Groundwater does not discharge to surface water at the site. The depth to groundwater ranges from approximately 25 to 40 feet. No surface water bodies (e.g., streams, ponds, or lakes) are present in the area, so there is no potential for groundwater to discharge at the surface. Two storm water recharge basins are present, but these are infiltration basins, which allow precipitation runoff to infiltrate into the groundwater.

Contaminants Leaching to Groundwater

The site-related VOCs exhibit relatively high water solubility and low K_{oc} values and, therefore, will leach into the groundwater. Potential contaminant source areas related to airfield activities are more than 55 years old; no new sources of contamination are likely to have occurred since that time, based on use of the site after the airfield closed. Therefore, leaching of contaminants from the unsaturated zone into the groundwater is likely to be minimal. In addition, more than 90 percent of the site is covered with asphalt paving, which would inhibit leaching of residual contaminants into the groundwater. No residual source areas that could continue to contaminate groundwater were found in the unsaturated zone during the extensive soil gas survey. The disposal of contaminated groundwater in the drain field west of Garden City Plaza Building 100 (Eckhardt and Pearsall 1989), however, may have input high levels of contamination into the deeper groundwater zones, as reflected by the sample results from SVP-4.

Groundwater Transport

Contaminants in groundwater can be transported in either a dissolved or particle-sorbed state. The sedimentary lithology is the primary influence on the physical behavior of groundwater, although long-term, large-scale pumping from wells can, and likely has, alter the natural flow of groundwater. Migration/exposure mechanisms for groundwater contaminants include groundwater use as a source of drinking water. However, groundwater from the supply wells is treated with air strippers prior to distribution for public use.

Volatilization

Volatilization is mainly a factor when groundwater contaminated with VOCs is withdrawn from the aquifer. At the Roosevelt site, no natural groundwater discharge to the surface is present.

Vapors in the unsaturated zone are subject to volatilization, especially when they reach the surface or other "discharge" point. Vapors detected during the soil gas survey are predominantly gasoline-related compounds, with limited detections of the site-related VOCs. Vapors can migrate along preferential flow paths into buildings, homes or other structures.

5.4.1 General Transport Processes

The mechanisms that govern contaminant transport in the groundwater flow regime (i.e., solute transport) include various physical and chemical processes. These transport processes include advection, hydrodynamic dispersion, diffusion, retardation (primarily via adsorption), and biodegradation.

Advection

Advection describes the process of solute migration, which due to the average bulk movement of groundwater, is typically the most important factor governing the transport of contaminants in groundwater. Advection defines the direction and velocity of a plume's center of mass. The advective transport term is computed using velocities determined by solving the groundwater flow equation, which is a function of hydraulic conductivity, hydraulic gradient, and flow cross-sectional area. Average linear groundwater velocity (v) is a function of hydraulic conductivity, hydraulic gradient, and effective porosity (η_e). Effective porosity values fall within the range of values of specific yield and total porosity. Specific yield (i.e., the amount of water released from storage per unit drop in piezometric head) represents the lower limit of reasonable effective porosity values.

Hydrodynamic Dispersion

Hydrodynamic dispersion describes the spread of contaminants around an average groundwater flow path, beyond the region they would normally occupy due to advection alone. Hydrodynamic dispersion is the sum of two processes, mechanical dispersion and molecular diffusion. Mechanical dispersion results from mixing that occurs as a consequence of local variations in groundwater velocity and the aquifer's matrix. Molecular diffusion results from variations in solute concentrations within the groundwater system. However, this effect is generally secondary to the mechanical dispersion effect (and often negligible) (Zheng 1992).

A dispersion term is incorporated to account for variability of flow (Reilly, *et al.* 1987). The most important variable in this respect is hydraulic conductivity. The coefficient of hydrodynamic dispersion is, therefore, typically reduced to the following equation:

$$D = \alpha v$$

where: D = coefficient of hydrodynamic dispersion
α = dispersivity
v = average linear groundwater velocity

In evaluating solute transport, dispersion is quantified by specifying longitudinal dispersivity and transverse dispersivity. Longitudinal dispersion (i.e., the magnitude of dispersion along, or parallel to, the average direction of groundwater flow in the horizontal plane) depends on longitudinal dispersivity (multiplied by advective velocity [v]). Similarly, transverse dispersion, or the magnitude of dispersion perpendicular to the average direction of groundwater flow, depends on transverse dispersivity. Typically, for fully three-dimensional solute transport evaluations involving dispersion, values are specified for longitudinal dispersivity (α_L), and the ratios of both horizontal transverse dispersivity (α_{Th}) and vertical transverse dispersivity (α_{Tv}) to the longitudinal dispersivity are specified.

Diffusion

Diffusion results from the movement of chemicals from higher concentration zones to lower concentration zones. Diffusion is solely dependent on concentration gradients and will occur even in materials of low hydraulic conductivities. Diffusion as a contaminant migration mechanism is most important when groundwater velocities are low, typically less than a few centimeters a year. The mass flux of a diffusing chemical is represented in the hydrodynamic dispersion equation as "De". Diffusion is likely insignificant when compared to dispersion in most settings.

Diffusion in solutions is the process whereby ionic or molecular constituents move under the influence of their kinetic activity in the direction of their concentration gradient. Diffusion occurs in the absence of any bulk hydraulic movement of the solution. If the solution is flowing, diffusion is a mechanism, along with mechanical dispersion, that causes mixing of ionic or molecular constituents. Diffusion ceases only when concentration gradients become nonexistent. The process of diffusion is often referred to as self-diffusion, molecular diffusion, or ionic diffusion. The mass of diffusing substance passing through a given cross section per unit time is proportional to the concentration gradient. This is known as Fick's first law. It can be expressed in the following equation (Freeze and Cherry 1979):

$$F = -D\, dC/dx$$

where:
- F = mass flux (mass of solute per unit area per unit time $[M/L^2T]$)
- D = diffusion coefficient $[L^2/T]$
- C = solute concentration $[M/L^3]$
- dC/dx = concentration gradient

The negative sign emphasizes that diffusion occurs in the direction of a drop in concentration. The diffusion coefficients are temperature-dependent.

Retardation

Dissolved contaminants may interact with aquifer solids encountered along the flow path via adsorption, partitioning, ion-exchange reactions, and other chemical and physical processes that remove the dissolved constituent from groundwater. These interactions distribute the contaminant between the aqueous phase and the aquifer solids, diminish concentrations of the contaminants in the aqueous phase, and retard the movement of the contaminant relative to groundwater flow (MacKay *et al.* 1985). The higher the fraction of contaminant sorbed, the more its transport is retarded. Due to the various physical and chemical removal processes (primarily adsorption), a solute may move more slowly than the groundwater. A typical method of generally describing this phenomenon in solute transport evaluations is by using a retardation factor. This factor, which has the form of a correction of the velocity of the movement of groundwater, is shown in the following equation (Freeze and Cherry 1979):

$$R = 1 + (\rho_b / \eta)\, K_d$$

where:
- ρ_b = effective bulk density
- η = effective porosity
- K_d = distribution coefficient
- R = retardation factor

The distribution coefficient is a function of the soil's and solute's chemistry, and therefore, is compound-specific. For volatile organic compounds, the amount of organic carbon present in the aquifer matrix is a key factor. The distribution coefficient is defined by:

$$K_d = C_s / C_w = f_{oc}\, K_{oc}$$

where:
- C_s = concentration by weight in soil
- C_w = concentration by volume in water
- f_{oc} = fraction of organic carbon
- K_{oc} = partitioning coefficient

These equations assume rapid reversible adsorption with a linear isotherm. Generally, the larger the K_d value, the greater the compound's affinity for the solid matrix (Rutgers University 1993). Some contaminants are described as being conservative, indicating very low K_d. For plumes characteristic of the VOC contaminants, the contaminant's mass moves at essentially the same rate as the average linear groundwater velocity.

For the Old Roosevelt site, the retardation factor for each contaminant was calculated and presented in Table 5-1. Calculated retardation factors of the five site-related VOCs are very low, indicating that these VOCs are mobile in groundwater at the site. Based on a flow rate of 1.8 ft/d (see Section 3.4.2) groundwater contamination from the Roosevelt site may have migrated beyond the two Village of Garden City supply wells in the years between about 1940 and 1953 when the wells began pumping. However, contamination that may have moved further south than these wells would likely have been drawn into the radial cone of influence created by the large volume of water withdrawn from these wells on a continuing basis.

5.5 Natural Attenuation

Natural attenuation of chlorinated VOCs in groundwater at the site appears to be present. PCE, TCE and several of their degradation products have been detected in groundwater samples. The abiotic and biotic transformation pathways for PCE, TCE, and carbon tetrachloride are illustrated in Figure 5-1.

The daughter products associated with each biodegradation chain are not detected (e.g., vinyl chloride), or are detected at low concentrations (e.g., *cis*-1,2-DCE, 1,1,-DCE). The daughter products in the carbon tetrachloride chain are detected the least frequently, indicating that natural attenuation of carbon tetrachloride, itself detected at very low levels, is probably not occurring. Overall, it appears that the daughter products associated with the biodegradation of PCE and TCE are not well represented in groundwater at the site, suggesting that anaerobic reductive dechlorination is not a dominant process in the groundwater. However, a full evaluation of natural attenuation will be conducted as part of the feasibility study for the site.

5.6 Conceptual Site Model

The Conceptual Site Model (CSM) was developed to integrate the different types of information collected during the RI into a coherent generalized model of contaminant distribution and migration at the site. The CSM incorporates geology, hydrogeology, site background and setting, and the fate and transport information collected during the RI. Two schematic diagrams of the CSM are shown in Figures 5-2 and 5-3. Figure 5-2 depicts the site during the 1940s (when the airfield was active) up to the 1970s and 1980s (when contaminated cooling water was discharged into the Pembroke recharge basin and the drain field). Figure 5-3 shows the current conditions at the site.

<u>Physical Setting with Respect to Groundwater Movement</u>

The Roosevelt site is located within the Atlantic Coastal Plain Physiographic Province. The geology of the Roosevelt site includes sedimentary deposits that thicken from

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about 800 feet at the northern edge of the Town of Hempstead to approximately 1,500 feet thick beneath the barrier islands. Sedimentary units encountered during drilling include the Magothy Formation and glacial deposits. These two units form a single aquifer beneath the site. The majority of supply wells in the vicinity are screened in the Magothy aquifer, which is approximately 500 feet thick and consists of interbedded sands, clayey sands, sandy clay, silts, and gravel. The Upper Glacial (water table) aquifer unconformably overlies the Magothy and consists of uniform glacial outwash deposits that are predominantly stratified sand and gravel. The water table ranges from 25 to 40 feet bgs.

Groundwater flow is to the south, toward the south shore of Long Island. Horizontal flow velocities in the unconfined water table aquifer are about 1.0 ft/d (McClymonds and Franke 1972). The potentiometric surface of the Magothy aquifer in the site's vicinity is similar to that of the water table in the Upper Glacial aquifer when Village of Garden City supply wells are off, but heads in the Magothy are generally 1 to 2 feet lower than the water table, and flow is slightly more westward. Average horizontal flow rates for the Magothy are about 0.3 ft/d (Eckhardt and Pearsall 1989). Site-specific calculations of flow in the Magothy indicate a rate of about 1.8 ft/d.

Groundwater on Long Island is derived from precipitation. The volume of water that percolates down to the water table and recharges the reservoir is the residual of the total precipitation not returned to the atmosphere by evapotranspiration or lost to the sea by runoff. The sandy nature of the surface and subsurface soils results in a high rate of infiltration. At the Roosevelt site, which is mostly covered by impervious surfaces such as buildings, paved parking lots, and roads, surface runoff is directed to dry wells or the nearby recharge basins. Natural replenishment of the Magothy aquifer is achieved by downward movement of water from the shallow aquifer through the sandy layers.

<u>**Potential Contaminant Sources to Groundwater**</u>

From the early parts of the twentieth century until 1951, the Roosevelt Field airfield was an active facility with runways, hangars, and air craft maintenance and repair shops. Based on aerial photographs, buildings were concentrated along both Old Country Road and Clinton Road, with airplanes parked on the sides of the buildings away from the roads, near the runways. Solvents such as TCE and PCE came into use for cleaning, degreasing, and de-icing in the late 1930s. Chlorinated solvents may have been used for a variety of purposes around the airfield complex. At the time, the common disposal method for used and/or spent solvents was direct discharge to the ground surface. It is unknown if solvents were discharged to the ground at centralized disposal areas, or discharged at the most convenient location at any given time. Historical aerial photographs of the air field facility do not show evidence of disposal areas. It is presumed that ground disposal of solvents most likely occurred close to hangars where aircraft maintenance was performed. Numerous discharge areas may have been used while the airfield was active.

Results of the soil gas survey completed in early 2006 indicated a few areas with elevated soil gas, but levels do not indicate the presence of residual sources in the unsaturated zone. Results of groundwater sampling in multi-port wells indicate significant groundwater contamination is present below the water table in the area where diffusion wells/drain field were used, west of Garden City Plaza Building 100.

Expected Transport and Fate of Site Contaminants in Groundwater

Liquid chlorinated solvents (e.g., TCE and PCE) discharged directly to the ground surface would be expected to migrate downward through the unsaturated zone in a relatively linear pattern, with minimal dispersion from the discharge location (Figure 5-2). The unsaturated zone at the Roosevelt site is primarily sandy material, so complex migration pathways along lower permeability zones was unlikely to occur. The unsaturated zone is approximately 25-40 feet thick.

Once the liquid chlorinated solvent encounters the water table, some of the solvent will become dissolved in the groundwater and begin to move in the direction of groundwater flow. If the quantity of solvent reaching the water table is sufficient, some of the solvent will remain in an undissolved state as a DNAPL and, since TCE and PCE are denser than water, the solvent will continue to move downward under the influence of gravity. No evidence of DNAPL was encountered at the site.

At the Roosevelt site, groundwater generally flows toward the south. However, the natural movement of groundwater and TCE/PCE in the saturated zone has been complicated by the extensive groundwater extraction that has occurred in the area from several types of wells. Village of Garden City supply wells 10 and 11 were put on line in the early 1950s, just after the Roosevelt Field airfield closed. Records for these wells indicate that at peak demand each well pumps about one mgd, with average demand about 0.65 mgd. The supply wells are screened from 377-417 feet bgs and 370-410 feet bgs, respectively, in the Magothy Formation. The large volume of water pumped from these wells since 1953 has likely caused a localized cone of depression in the groundwater. The pumping pulls groundwater into the wells and has limited the downgradient movement of the contaminants. These wells have served as an effective remediation system since they began pumping, but especially since they were equipped with air stripping treatment systems in the 1980s.

Groundwater contamination from the Roosevelt site may have migrated beyond the two Village of Garden City supply wells in the years between about 1940 and 1953 when the wells began pumping. However, contamination that may have moved further south than these wells would likely have been drawn into the radial cone of influence created by the large volume of water withdrawn from these wells on a continuing basis.

In addition to the Village of Garden City supply wells, seven cooling water wells pumped groundwater from the Magothy for use in building air conditioning systems. Cooling water wells pumped variable amounts of water, with greater extraction rates during the hot summer months. These wells operated from approximately 1960 to 1985. After extracted groundwater was used in building air conditioning systems, the untreated water was returned to the aquifer system via surface recharge in the Pembrook recharge basin at the southern end of the Roosevelt Field mall/office complex or, after minimal treatment, to a drain field west of Buildings 100 and 200. Surface discharge of contaminated groundwater spread contamination through the Upper Glacial and Magothy aquifers. The recharge basin and drain field also created localized groundwater mounding, which further spread contamination at the water table (Figure 5-2).

The discharge of contaminated water into the recharge basin and drain field ceased in about 1985 when the cooling water wells were taken out of service. The long-term impact of discharging VOC-contaminated water to the soils in the Pembrook recharge basin was likely minimal. Given the high porosity and permeability of the soils, VOCs likely volatilized quickly and did not significantly accumulate in the basin soils. The Pembrook recharge basin currently only receives surficial stormwater runoff from parking lots surrounding the mall and the office buildings. Any residual VOCs within the soils underlying the basin, from the cooling water wells, would have been removed during the past 20 years by natural groundwater recharge. The soils are not considered a source of groundwater contamination for the site. The drain field/diffusion wells near Building 100 are under the paved parking lot west of Building 100 and 200 and are not currently identifiable in the field. Significant groundwater contamination is present at SVP-4, which was located near the general area of the diffusion wells/drain field.

Chlorinated solvents (such as TCE and PCE in a dissolved phase) move with the groundwater flow, but generally at a slower rate than groundwater. If disposal of TCE and/or PCE is assumed to have begun in 1945, at an estimated flow rate of 1 ft/d for the Upper Glacial and 1.8 ft/d for the Magothy, in 55 years contaminated groundwater would have migrated about 20,000 feet or 3.5 miles in the Upper Glacial and about 36,135 feet or about 6.5 miles in the Magothy. However, pumping of Village of Garden City supply wells 10 and 11 and the air conditioning cooling wells, probably slowed the movement of contaminants by altering the natural movement of groundwater and any contaminants associated with groundwater. The two Village of Garden City supply wells continue to pump large volumes of water and have a direct influence on the localized groundwater flow. Pumping from these wells has limited the spread of the groundwater contamination over the years. Carbon tetrachloride is believed to have resulted from the use of water in the building cooling systems.

Natural attenuation of chlorinated solvents is a documented process, with PCE and TCE breaking down through a known decay chain of compounds. Some of these daughter compounds (e.g., DCE) have been detected within the complex Roosevelt plume, although at very low levels. Natural attenuation processes may be occurring in the aquifer on a limited basis.

5.7 Fate and Transport Summary

The persistence of contaminants is determined by the rate of degradation, velocity of the groundwater, the geochemical conditions in the aquifer, and the retardation coefficient (Kd) of the individual compounds. The Kd values in Table 5-1 show that the site-related VOCs will have low adsorption to the materials in the aquifer. No residual sources in the unsaturated zone were identified.

The site-related VOCs are mobile and are expected to move with the groundwater, although at a slower rate. The large scale pumping from these wells has altered the natural groundwater flow, and has limited the downgradient movement of the contaminant plume. Natural attenuation via biodegradation appears to be limited, and due to the oxic conditions found in the aquifer, is not likely to sufficiently reduce contaminant levels.

6 Section Six

Section 6
Risk Assessment Summary

6.1 Human Health Risk Assessment

Carcinogenic risks and noncarcinogenic hazards for exposures to contaminants in groundwater at the site that were quantitatively evaluated for potential health threats.

Future Site Workers
Risks and hazards were evaluated for incidental ingestion of groundwater. The total incremental lifetime cancer risk estimates are:

- Reasonable maximum exposure (RME) cancer risk: 2×10^{-4}
- Central tendency exposure (CTE) cancer risk: 6×10^{-5}

The RME cancer risk is slightly above the EPA's target range of 1×10^{-6} to 1×10^{-4}.

HIs greater than 1 indicate the potential for non-cancer hazards. The calculated HIs are:

- RME HI: 3
- CTE HI: 3

The total HI based on individual health endpoints for the RME and CTE scenario is above EPA's acceptable threshold of 1 and could possibly have adverse effects on the central nervous system. TCE contributes most of the potential non-cancer hazard.

Future Residents
Risks and hazards were evaluated for incidental ingestion, inhalation and dermal contact with contaminated groundwater. The total incremental lifetime cancer risk estimates are:

- Adult: RME cancer risk: 2×10^{-3} and CTE cancer risk: 3×10^{-4}
- Child: RME cancer risk: 6×10^{-3} and CTE cancer risk: 8×10^{-4}

These estimates are above EPA's target range of 1×10^{-6} to 1×10^{-4}. Exposure to PCE and TCE in groundwater account for the majority of the risk.

HIs greater than 1 indicate the potential for non-cancer hazards. The calculated HIs are:

- Adult: RME HI: 10 and CTE HI: 6
- Child: RME HI: 35 and CTE HI: 10

The total HI based on individual health endpoints is above EPA's acceptable threshold of unity (1). Target organ HIs for the liver, kidney, fetus, and central nervous system are also above EPA's threshold of unity due to TCE in the groundwater.

Screening of deep soil gas samples against values in EPA's 2002 *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway* indicates that the potential for vapor intrusion exists on-site. Therefore, any structures constructed there in the future should be evaluated for soil vapor intrusion until groundwater and soil gas concentrations reach levels that would no longer be of concern. More information about the vapor intrusion investigation at the site can be found in a separate report in the administrative record.

6.2 Screening Level Ecological Risk Assessment

The initial activities associated with a SLERA, as described in ERAGs (1997), were completed for this investigation. The first step was to obtain information regarding the environmental setting and chemical contamination at the site by compiling information from the site history and other reports related to the site. This was followed by collecting additional information related to the ecological resources at the site, through consultation with the U.S. Fish and Wildlife Service (USFWS) and NYSDEC, regarding threatened and endangered species, as well as utilizing USGS topographical maps and aerial photographs. Finally, a site visit was performed to obtain detailed information relating to the habitat types present at the site and to identify the flora and fauna at the site.

An evaluation of the information and data that was collected was then performed, and the results of the evaluation indicated that a scientific/management decision point (SMDP) was reached. During the SLERA process, there are three possible outcomes that can be reached at the SMDP:

(1) There is adequate information to conclude that ecological risks are negligible and therefore there is no need for remediation on the basis of ecological risk.

(2) The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue.

(3) The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.

As described in Sections 5.1 and 5.4, VOCs in the groundwater are the primary contaminants, and groundwater is the primary medium of concern at the site. Given that groundwater does not discharge to a surface water body, which prevents exposure to any potential ecological receptor at the site, a conclusion can be reached that there are no completed pathways present at the site for ecological receptors. In addition, the RI investigation concluded that the source areas are no longer present at the site, which prevents any potential exposure to contaminated soil for ecological receptors. Based on this information, there is adequate information to conclude that ecological risks are negligible and therefore there is no need for remediation on the basis of ecological risk.

7 Section Seven

Section 7
Conclusions

7.1 Groundwater Conclusions
Based on data collected during RI hydrogeological investigation, the following conclusions regarding groundwater contamination at the Roosevelt Field site are presented.

- The main VOCs associated with the Roosevelt site groundwater contamination are: PCE, TCE, 1,1-DCE, cis-1,2-DCE, and carbon tetrachloride.

- The TCE/PCE contaminant plume has migrated south from the area used as an airfield prior to 1951. The natural southerly flow of groundwater has been interrupted by large scale pumping at the two Village of Garden City supply wells south of the mall complex. These supply wells have, in effect, limited the migration of the plume and prevented migration further south.

- At the SVP/GWM-4 area, the core of the plume is located at approximately 250 to 310 feet bgs. This area was formerly used as a drain field/distilling well for subsurface disposal of cooling water that was contaminated with the site-related VOCs.

- South of the two Village of Garden City supply wells, VOC contamination is shallower, and is like to be related to two contaminant sources (Pasley and Purex) south of the Roosevelt Field site.

- The RI has sufficiently determined the nature and extent of groundwater contamination at the site, and enough data exist to proceed with the FS.

- Discharge of contaminated cooling water to Pembrook Basin until the mid-1980s may have spread contamination within the shallow aquifer. However, the sandy nature of the discharge basis soils likely did not result in retention of VOCs within the unsaturated zone. In addition, the zone below the recharge basis has been flushed with stormwater runoff for 20 years; residual contamination from Roosevelt Field is not likely to remain in the area.

7.2 Soil Gas Conclusions
Based on data collected during the RI source area soil gas investigation, the following conclusions regarding soil gas at the Roosevelt Field site are presented.

- One small soil gas hot spot was noted from soil gas samples analyzed via method TO-15 in an area of Hazelhurst Park, along Clinton Road, west of the office building at 100 Ring Road. EPA evaluated this hot spot with both additional vapor samples on the west side of Clinton Road and with soil samples analyzed for VOCs. The results of these additional samples can be found in a separate report in the administrative record.

- Most detected VOC compounds are associated with gasoline and are not the site-related VOCs.

The best location to compare detections in groundwater and soil gas canister samples in or near Hazelhurst Park is at existing well 9953 (screened at 35-40 feet bgs) and SVP-4 port 10 (at 45-50 feet bgs).

A very limited number of VOCs were detected at very low levels in the groundwater, including PCE, TCE, cis-1,2-DCE, acetone, MTBE, methylene chloride, and dibromochloromethane.

Numerous VOCs were detected in the soil gas analytical samples collected in Hazelhurst Park: PCE, TCE, cis-1,2-DCE, ethanol, isopropyl alcohol, 1,3 butadiene, carbon disulfide, 1,1,2-trichloro-1,2,2-trifluoroethane, acetone, methylene chloride, hexane, 1,1-DCA, 2-butanone, chloroform, 1,1,1-trichloroethane, cyclohexane, 2,2,4-trimethylpentane, benzene, n-heptane, toluene, ethylbenzene, m-xylene, o-xylene, and 1,2,4-trimethylbenzene.

Three VOCs were detected in both the groundwater at the top of the water table and the soil gas samples in Hazelhurst Park: PCE, TCE, and cis-1,2-DCE. The majority of VOC compounds detected in the soil gas samples are related to gasoline and are, therefore, considered non-site related. The source of the chlorinated VOCs (e.g., TCE, PCE, and cis-1,2-DCE) in the soil gas is unknown. A review of historical aerial photos from the 1930s and 1940s indicates that the location of Clinton Road has not changed over the years. The airfield buildings faced the street, with lawns and occasional shrubs fronting the buildings on the street side. There is no evidence of airplane use in the area that is now Hazelhurst Park. All airplanes were parked (and presumably maintained) on the sides of the buildings that faced away from the street, closer to the runways. It is highly unlikely spent solvents were disposed of in the landscaped areas in the front of the buildings along Clinton Road.

Section Eight

Section 8
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Tables

Table 1-1
Historical Groundwater Results
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Well ID	Aquifer	Screened Interval (feet bgs)	Diameter	Status	Date Sampled	1,2-DCE	TCE	PCE	Total VOCs
FORMER COOLING WATER WELL									
N-8050 (100 Ring Road)	Magothy	300-328	8 inches	Inactive	06/23/81	975	3,700	61	4,800
					05/18/82	1,500	2,400	54	4,100
					08/04/83	720	2,100	34	2,900
					08/04/83	1,400	13,000	36	14,000
					05/02/84	2,800	38,000	87	41,000
					05/02/84	2,500	23,000	77	26,000
					08/07/84	1,100	13,000	47	14,000
					11/15/93	110	230	2	342
					05/25/95	10	14	<2	26
					06/24/03	48	55	1	105
ACTIVE PUMPING WELLS									
GWP-10	Magothy	377-417	18 inches	Active with air stripper; 1,400 gpm capacity	09/20/77		7		7
					10/17/78	<1	11	1	12
					10/02/79		10	1	11
					10/06/80	<30	11	4	20
					10/13/81	<1	8	2	14
					03/16/82		6	2	14
					08/24/83	<4	9	1	13
					07/13/84		18	3	21
					07/09/85		33	6	39
					05/27/86		38		49
					05/05/87		53		74
					07/02/88		95		95
					11/09/89	<0.5	120	33	181
					10/15/90		230	100	377
					09/20/91	<0.5	420	300	720
					07/13/92	43	480	340	865
					12/06/93	37	630	720	1,390
					06/15/94	100	720	680	1,512
					03/13/95	38	630	640	1,308
					04/11/96	95	1,400	750	2,260
					10/08/98	14	170	1,100	1,417
					09/17/99	37	400	480	1,024
					03/20/00	24	290	480	905
					02/21/01	36	330	340	729
					01/07/02	38	370	270	700
					09/02/03	26	270	200	518
					01/06/04	26	260	210	514
GWP-11	Magothy	370-410	18 inches	Active with air stripper; 1,400 gpm capacity	09/20/77		9	<2	9
					11/08/78	1	13	1	15
					09/11/79		12	1	27
					10/06/80	<30	14	5	24
					09/15/81		14	5	24
					09/14/82	1	13		14
					08/24/83	<4	15	2	24
					04/11/84	<4	18	3	27
					05/07/85		33	5	45
					07/17/86		18		18
					05/07/87		23		44
					09/26/88		48	4	152
					05/30/89		62	2	64
					12/17/90		94	7	169
					07/19/91	16	240	26	317
					12/14/92		330	11	347
					11/22/93	53	630	180	875
					06/15/94	99	760	240	1,147
					01/16/95	46	700	130	890
					04/11/96	80	910	30	1,086
					07/18/97	64	750	250	1,083
					01/05/98	58	710	240	1,021
					01/19/99	47	500	210	765
					01/04/00	43	410	110	575
					01/15/01	41	350	38	459
					08/19/02	21	240	24	303
					12/03/03	13	140	16	186
					10/25/2004	20	200	66	305

Notes:
All results are in micrograms per liter (µg/L)
Blank = Not Analyzed
bgs = below ground surface
gpm = gallons per minute
1,2-DCE = 1,2-dichloroethene
TCE = trichloroethene
PCE = tetrachloroethylene
VOC = volatile organic compound

Table 2-1
Summary of RI Field Activities
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Field Activity	Dates
Hydrogeological Investigation	
Surface Geophysical Survey	6/20/05
Drilling and Groundwater Screening; Downhole Gamma Logging	7/10/05-12/2/05
Outer Screen and Casing Installation and Development; Multi-port Monitoring Well Installation	8/26/05-3/17/06
Existing Well Assessment and Redevelopment	2/1/06-2/4/06
Groundwater Sampling and Water Levels (Multi-port Wells, Existing Monitoring Wells, Supply Wells)	3/25/06-7/20/06
Well Location Survey	4/6/06
Source Area Soil Gas Investigation	
Surface Geophysical Survey	12/8/05-12/13/05
Soil Gas Screening	12/12/05-1/4/06
Soil Gas Outdoor Building Boring TO-15 Sampling	1/5/06-1/6/06
Ecological Investigation	9/7/06
Cultural Resources Survey	5/05

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Table 2-2
Groundwater Screening Samples
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
SVPGW-01	SVPGW-01-370	11/3/2005	TCL VOA	
	SVPGW-01-390	11/3/2005	TCL VOA	MS/MSD
	SVPGW-01-410	11/3/2005	TCL VOA	
	SVPGW-01-430	11/3/2005	TCL VOA	
	SVPGW-01-450	11/3/2005	TCL VOA	
	SVPGW-01-350	11/4/2005	TCL VOA	
	SVPGW-01-330	11/4/2005	TCL VOA	
	SVPGW-01-310	11/4/2005	TCL VOA	
	SVPGW-01-290	11/4/2005	TCL VOA	
	SVPGW-01-170	11/7/2005	TCL VOA	
	SVPGW-01-190	11/7/2005	TCL VOA	
	SVPGW-01-210	11/7/2005	TCL VOA	
	SVPGW-01-250	11/7/2005	TCL VOA	
	SVPGW-01-230	11/7/2005	TCL VOA	
	SVPGW-01-270	11/7/2005	TCL VOA	
	SVPGW-01-50	11/8/2005	TCL VOA	
	SVPGW-01-130	11/8/2005	TCL VOA	
	SVPGW-01-70	11/8/2005	TCL VOA	
	SVPGW-01-110	11/8/2005	TCL VOA	
	SVPGW-01-150	11/8/2005	TCL VOA	MS/MSD
	SVPGW-01-90	11/8/2005	TCL VOA	
	SVPGW-45-370	11/3/2005	TCL VOA	Duplicate of SVPGW-01-370
	SVPGW-45-130	11/8/2005	TCL VOA	Duplicate of SVPGW-01-130
SVPGW-02	SVPGW-02-450	9/8/2005	TCL VOA	
	SVPGW-02-430	9/8/2005	TCL VOA	
	SVPGW-02-310	9/9/2005	TCL VOA	
	SVPGW-02-330	9/9/2005	TCL VOA	
	SVPGW-02-370	9/9/2005	TCL VOA	
	SVPGW-02-390	9/9/2005	TCL VOA	MS/MSD
	SVPGW-02-410	9/9/2005	TCL VOA	
	SVPGW-02-290	9/12/2005	TCL VOA	

Table 2-2
Groundwater Screening Samples
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
SVPGW-02 (continued)	SVPGW-02-270	9/12/2005	TCL VOA	
	SVPGW-02-230	9/12/2005	TCL VOA	
	SVPGW-02-210	9/12/2005	TCL VOA	
	SVPGW-02-110	9/13/2005	TCL VOA	
	SVPGW-02-130	9/13/2005	TCL VOA	
	SVPGW-02-150	9/13/2005	TCL VOA	MS/MSD
	SVPGW-02-190	9/13/2005	TCL VOA	
	SVPGW-02-70	9/14/2005	TCL VOA	
	SVPGW-02-250	9/12/2005	TCL VOA	
	SVPGW-02-50	9/14/2005	TCL VOA	
	SVPGW-02-90	9/14/2005	TCL VOA	
	SVPGW-02-170	9/13/2005	TCL VOA	
	SVPGW-02-350	9/9/2005	TCL VOA	
	SVPGW-90-170	9/13/2005	TCL VOA	Duplicate of SVPGW-02-170
	SVPGW-90-350	9/9/2005	TCL VOA	Duplicate of SVPGW-02-350
SVPGW-03	SVPGW-03-250	8/22/2005	TCL VOA	
	SVPGW-03-450	8/24/2005	TCL VOA	
	SVPGW-03-410	8/25/2005	TCL VOA	
	SVPGW-03-430	8/25/2005	TCL VOA	MS/MSD
	SVPGW-03-290	8/26/2005	TCL VOA	
	SVPGW-03-310	8/26/2005	TCL VOA	
	SVPGW-03-330	8/26/2005	TCL VOA	
	SVPGW-03-350	8/26/2005	TCL VOA	
	SVPGW-03-370	8/26/2005	TCL VOA	
	SVPGW-03-230	8/29/2005	TCL VOA	
	SVPGW-03-170	8/29/2005	TCL VOA	
	SVPGW-03-270	8/29/2005	TCL VOA	
	SVPGW-03-210	8/29/2005	TCL VOA	
	SVPGW-03-190	8/29/2005	TCL VOA	
	SVPGW-03-50	8/30/2005	TCL VOA	
	SVPGW-03-70	8/30/2005	TCL VOA	

Table 2-2
Groundwater Screening Samples
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
SVPGW-03 (continued)	SVPGW-03-90	8/30/2005	TCL VOA	
	SVPGW-03-110	8/30/2005	TCL VOA	
	SVPGW-03-150	8/30/2005	TCL VOA	MS/MSD
	SVPGW-03-390	8/25/2005	TCL VOA	
	SVPGW-03-130	8/30/2005	TCL VOA	
	SVPGW-88-390	8/25/2005	TCL VOA	Duplicate of SVPGW-03-390
	SVPGW-88-130	8/30/2005	TCL VOA	Duplicate of SVPGW-03-130
SVPGW-04	SVPGW-04-129	7/8/2005	TCL VOA	
	SVPGW-04-109	7/8/2005	TCL VOA	
	SVPGW-04-89	7/8/2005	TCL VOA	
	SVPGW-04-69	7/8/2005	TCL VOA	
	SVPGW-04-49	7/8/2005	TCL VOA	
	SVPGW-04-409	7/20/2005	TCL VOA	
	SVPGW-04-349	7/21/2005	TCL VOA	
	SVPGW-04-369	7/21/2005	TCL VOA	
	SVPGW-04-329	7/21/2005	TCL VOA	
	SVPGW-04-309	7/22/2005	TCL VOA	
	SVPGW-04-249	7/22/2005	TCL VOA	
	SVPGW-04-269	7/22/2005	TCL VOA	
	SVPGW-04-289	7/22/2005	TCL VOA	
	SVPGW-04-229	7/25/2005	TCL VOA	
	SVPGW-04-169	7/25/2005	TCL VOA	
	SVPGW-04-149	7/25/2005	TCL VOA	
	SVPGW-04-209	7/25/2005	TCL VOA	
	SVPGW-04-189	7/25/2005	TCL VOA	
	SVPGW-04-422	8/17/2005	TCL VOA	
	SVPGW-04-389	7/21/2005	TCL VOA	
	SVPGW-40-389	7/21/2005	TCL VOA	Duplicate of SVPGW-04-389
SVPGW-05	SVPGW-05-450	8/1/2005	TCL VOA	
	SVPGW-05-330	8/3/2005	TCL VOA	
	SVPGW-05-350	8/3/2005	TCL VOA	

Table 2-2
Groundwater Screening Samples
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
SVPGW-05 (continued)	SVPGW-05-370	8/3/2005	TCL VOA	
	SVPGW-05-390	8/3/2005	TCL VOA	MS/MSD
	SVPGW-05-410	8/3/2005	TCL VOA	
	SVPGW-05-430	8/3/2005	TCL VOA	
	SVPGW-05-270	8/4/2005	TCL VOA	
	SVPGW-05-250	8/4/2005	TCL VOA	
	SVPGW-05-310	8/4/2005	TCL VOA	
	SVPGW-05-290	8/4/2005	TCL VOA	
	SVPGW-05-230	8/4/2005	TCL VOA	
	SVPGW-05-210	8/5/2005	TCL VOA	
	SVPGW-05-190	8/5/2005	TCL VOA	
	SVPGW-05-170	8/5/2005	TCL VOA	
	SVPGW-05-110	8/5/2005	TCL VOA	
	SVPGW-05-130	8/5/2005	TCL VOA	
	SVPGW-05-90	8/8/2005	TCL VOA	MS/MSD
	SVPGW-05-50	8/8/2005	TCL VOA	
	SVPGW-05-70	8/8/2005	TCL VOA	
	SVPGW-05-150	8/5/2005	TCL VOA	
	SVPGW-50-150	8/5/2005	TCL VOA	Duplicate of SVPGW-05-150
SVPGW-06	SVPGW-06-390	10/21/2005	TCL VOA	
	SVPGW-06-410	10/21/2005	TCL VOA	
	SVPGW-06-430	10/21/2005	TCL VOA	
	SVPGW-06-450	10/21/2005	TCL VOA	
	SVPGW-06-350	10/24/2005	TCL VOA	MS/MSD
	SVPGW-06-330	10/24/2005	TCL VOA	
	SVPGW-06-370	10/24/2005	TCL VOA	
	SVPGW-06-310	10/24/2005	TCL VOA	
	SVPGW-06-230	10/25/2005	TCL VOA	
	SVPGW-06-250	10/25/2005	TCL VOA	
	SVPGW-06-270	10/25/2005	TCL VOA	
	SVPGW-06-290	10/25/2005	TCL VOA	

Table 2-2
Groundwater Screening Samples
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
SVPGW-06 (continued)	SVPGW-06-210	10/25/2005	TCL VOA	
	SVPGW-06-190	10/25/2005	TCL VOA	
	SVPGW-06-50	10/26/2005	TCL VOA	
	SVPGW-06-90	10/26/2005	TCL VOA	
	SVPGW-06-110	10/26/2005	TCL VOA	
	SVPGW-06-130	10/26/2005	TCL VOA	
	SVPGW-06-150	10/26/2005	TCL VOA	
	SVPGW-06-170	10/26/2005	TCL VOA	MS/MSD
	SVPGW-06-70	10/26/2005	TCL VOA	
	SVPGW-65-270	10/25/2005	TCL VOA	Duplicate of SVPGW-06-270
	SVPGW-65-130	10/26/2005	TCL VOA	Duplicate of SVPGW-06-130
SVPGW-07	SVPGW-07-410	9/22/2005	TCL VOA	
	SVPGW-07-430	9/22/2005	TCL VOA	
	SVPGW-07-450	9/22/2005	TCL VOA	
	SVPGW-07-390	9/22/2005	TCL VOA	
	SVPGW-07-330	9/23/2005	TCL VOA	
	SVPGW-07-350	9/23/2005	TCL VOA	
	SVPGW-07-370	9/23/2005	TCL VOA	MS/MSD
	SVPGW-07-270	9/26/2005	TCL VOA	
	SVPGW-07-290	9/26/2005	TCL VOA	
	SVPGW-07-310	9/26/2005	TCL VOA	
	SVPGW-07-250	9/26/2005	TCL VOA	
	SVPGW-07-230	9/26/2005	TCL VOA	
	SVPGW-07-190	9/26/2005	TCL VOA	
	SVPGW-07-210	9/26/2005	TCL VOA	
	SVPGW-07-70	9/27/2005	TCL VOA	
	SVPGW-07-50	9/27/2005	TCL VOA	
	SVPGW-07-90	9/27/2005	TCL VOA	
	SVPGW-07-110	9/27/2005	TCL VOA	
	SVPGW-07-130	9/27/2005	TCL VOA	
	SVPGW-07-150	9/27/2005	TCL VOA	MS/MSD

Table 2-2
Groundwater Screening Samples
Old Roosevelt Field Contaminated Groundwater Area Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
SVPGW-07 (continued)	SVPGW-07-170	9/27/2005	TCL VOA	
	SVPGW-91-410	9/22/2005	TCL VOA	Duplicate of SVPGW-07-410
	SVPGW-91-170	9/27/2005	TCL VOA	Duplicate of SVPGW-07-170
SVPGW-08	SVPGW-08-430	10/5/2005	TCL VOA	
	SVPGW-08-450	10/5/2005	TCL VOA	
	SVPGW-08-350	10/6/2005	TCL VOA	
	SVPGW-08-390	10/6/2005	TCL VOA	
	SVPGW-08-410	10/6/2005	TCL VOA	
	SVPGW-08-370	10/6/2005	TCL VOA	
	SVPGW-08-270	10/7/2005	TCL VOA	
	SVPGW-08-290	10/7/2005	TCL VOA	
	SVPGW-08-310	10/7/2005	TCL VOA	MS/MSD
	SVPGW-08-330	10/7/2005	TCL VOA	
	SVPGW-08-250	10/11/2005	TCL VOA	
	SVPGW-08-230	10/12/2005	TCL VOA	
	SVPGW-08-190	10/12/2005	TCL VOA	
	SVPGW-08-210	10/12/2005	TCL VOA	
	SVPGW-08-110	10/13/2005	TCL VOA	
	SVPGW-08-130	10/13/2005	TCL VOA	
	SVPGW-08-150	10/13/2005	TCL VOA	
	SVPGW-08-170	10/13/2005	TCL VOA	
	SVPGW-08-90	10/14/2005	TCL VOA	MS/MSD
	SVPGW-08-70	10/14/2005	TCL VOA	
	SVPGW-08-50	10/14/2005	TCL VOA	
	SVPGW-85-370	10/6/2005	TCL VOA	Duplicate of SVPGW-08-370
	SVPGW-85-210	10/12/2005	TCL VOA	Duplicate of SVPGW-08-210

Notes:
MS/MSD = matrix spike/matrix spike duplicate
SVPGW = vertical profile groundwater screening
TCL = target compound list
VOA = volatile organic analysis

Table 2-3
Multi-port Well Construction Details
Old Roosevelt Field Groundwater Contamination Site
Garden City, New York

Well ID	Westbay Port Designation	Screen Interval Depth (feet bgs)	Packer Interval Depth (feet bgs)	Measurement and Sampling Port Depth (feet bgs)	Pumping Port Depth (feet bgs)
SVP-01	10	50-55	50-62	58	53
	9	100-105	100-112	108	103
	8	150-155	150-162	158	153
	7	200-205	200-212	208	203
	6	250-255	250-262	258	253
	5	290-295	290-302	298	293
	4	315-320	310-322	323	318
	3	370-375	370-382	378	373
	2	400-405	400-412	408	403
	1	450-455	445	455	450
SVP-02	10	50-55	50-62	58	53
	9	100-105	100-112	108	103
	8	150-155	150-162	158	153
	7	190-195	190-202	198	193
	6	250-255	250-262	258	253
	5	290-295	290-302	298	293
	4	330-335	330-342	338	333
	3	370-375	370-382	378	373
	2	410-415	410-422	418	413
	1	450-455	445	455	450
SVP-03	7	50-55	50-62	58	53
	6	100-105	100-112	108	103
	5	170-175	170-182	178	173
	4	290-295	290-302	298	293
	3	370-375	370-387	378	373
	2	390-395	390-402	398	393
	1	450-455	445	455	450
SVP-04	10	45-50	45-57	53	48
	9	100-105	100-112	108	103
	8	145-150	145-157	153	148
	7	185-190	185-197	193	188
	6	245-250	245-257	253	253
	5	285-290	285-297	293	288
	4	305-310	305-317	313	308
	3	350-355	350-362	358	353
	2	400-405	395-412	405	400
	1	420-425	415-436	425	420
SVP-05	10	45-50	45-57	53	48
	9	95-100	95-107	103	98
	8	150-155	150-162	158	153
	7	190-195	190-202	198	193
	6	250-255	250-262	258	253
	5	290-295	290-307	298	293
	4	310-315	310-322	318	313
	3	355-360	355-367	363	358
	2	405-410	405-417	413	408
	1	430-435	425	435	430

Table 2-3
Multi-port Well Construction Details
Old Roosevelt Field Groundwater Contamination Site
Garden City, New York

Well ID	Westbay Port Designation	Screen Interval Depth (feet bgs)	Packer Interval Depth (feet bgs)	Measurement and Sampling Port Depth (feet bgs)	Pumping Port Depth (feet bgs)
SVP-06	6	45-50	45-57	53	48
	5	100-105	100-112	108	103
	4	175-180	175-187	183	178
	3	245-250	245-257	253	248
	2	365-370	365-377	373	368
	1	445-450	440	450	445
SVP-07	6	45-50	45-57	53	48
	5	100-105	100-112	108	103
	4	205-210	205-217	213	208
	3	310-315	310-322	318	315
	2	425-430	425-437	433	428
	1	445-450	445	450	445
SVP-08	6	45-50	45-57	53	48
	5	100-105	100-112	108	103
	4	155-160	155-162	163	158
	3	235-240	235-247	243	238
	2	370-375	370-382	378	373
	1	435- 440	430	440	435

Notes:
bgs = below ground surface

Table 2-4a
Summary of Multi-port Well, Existing Well, and Supply Well Samples - Round 1
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
GWM-01	GWM-01-2-R1	4/12/2006	LDL VOC	
	GWM-01-3-R1	4/13/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	MS/MSD
	GWM-01-4-R1	4/12/2006	LDL VOC	
	GWM-01-5-R1	4/12/2006	LDL VOC	
	GWM-01-6-R1	4/12/2006	LDL VOC	
	GWM-01-7-R1	4/12/2006	LDL VOC	
	GWM-01-8-R1	4/12/2006	LDL VOC	
	GWM-01-9-R1	4/12/2006	LDL VOC	
	GWM-01-10-R1	4/12/2006	LDL VOC	
GWM-02	GWM-02-1-R1	4/7/2006	LDL VOC	
	GWM-02-2-R1	4/7/2006	LDL VOC	
	GWM-02-3-R1	4/7/2006	LDL VOC	
	GWM-02-4-R1	4/7/2006	LDL VOC	
	GWM-02-5-R1	4/7/2006	LDL VOC	
	GWM-02-6-R1	4/10/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe+2, H2S, Soluble Mg)	
	GWM-02-6-R1 Dup	4/10/2006		Duplicate of GWM-02-6-R1
	GWM-02-7-R1	4/7/2006	LDL VOC	
	GWM-02-8-R1	4/7/2006	LDL VOC	
	GWM-02-9-R1	4/7/2006	LDL VOC	
	GWM-02-10-R1	4/7/2006	LDL VOC	
GWM-03	GWM-03-1-R1	3/27/2006	LDL VOC	
	GWM-03-2-R1	3/28/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-03-3-R1	3/28/2006	LDL VOC	
	GWM-03-4-R1	3/28/2006	LDL VOC	
	GWM-03-5-R1	3/28/2006	LDL VOC	
	GWM-03-6-R1	3/28/2006	LDL VOC	
	GWM-03-7-R1	3/28/2006	LDL VOC	
GWM-04	GWM-04-1-R1	4/11/2006	LDL VOC	
	GWM-04-2-R1	4/11/2006	LDL VOC	
	GWM-04-3-R1	4/11/2006	LDL VOC	
	GWM-04-4-R1	4/11/2006	LDL VOC	
	GWM-04-5-R1	4/11/2006	LDL VOC	
	GWM-04-7-R1	4/11/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-04-8-R1	4/11/2006	LDL VOC	
	GWM-04-9-R1	4/11/2006	LDL VOC	
	GWM-04-10-R1	4/11/2006	LDL VOC	
GWM-05	GWM-05-1-R1	4/14/2006	LDL VOC	
	GWM-05-2-R1	4/14/2006	LDL VOC	
	GWM-05-3-R1	4/14/2006	LDL VOC	
	GWM-05-4-R1	4/14/2006	LDL VOC	
	GWM-05-5-R1	4/14/2006	LDL VOC	
	GWM-05-6-R1	4/14/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-05-7-R1	4/14/2006	LDL VOC	
	GWM-05-8-R1	4/14/2006	LDL VOC	
	GWM-05-9-R1	4/14/2006	LDL VOC	
	GWM-05-10-R1	4/14/2006	LDL VOC	
GWM-06	GWM-06-1-R1	3/31/2006	LDL VOC	
	GWM-06-2-R1	3/31/2006	LDL VOC	
	GWM-06-3-R1	3/31/2006	LDL VOC	
	GWM-06-4-R1	3/31/2006	LDL VOC	

Table 2-4a

Summary of Multi-port Well, Existing Well, and Supply Well Samples - Round 1

Old Roosevelt Field Contaminated Groundwater Site

Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
GWM-06 (continued)	GWM-06-5-R1	3/30/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	MS/MSD
	GWM-06-6-R1	3/31/2006	LDL VOC	
	GWM-06-6-R1-Dup	3/31/2006	LDL VOC	Duplicate of GWM-06-6-R1
GWM-07	GWM-07-1-R1	4/3/2006	LDL VOC	
	GWM-07-2-R1	4/4/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	MS/MSD
	GWM-07-3-R1	4/3/2006	LDL VOC	
	GWM-07-4-R1	4/3/2006	LDL VOC	
	GWM-07-5-R1	4/3/2006	LDL VOC	
	GWM-17-5-R1	4/3/2006	LDL VOC	Duplicate of GWM-07-5-R1
	GWM-17-5-R1-Dup			
GWM-08	GWM-08-1-R1	4/5/2006	LDL VOC	
	GWM-08-2-R1	4/5/2006	LDL VOC	
	GWM-08-3-R1	4/5/2006	LDL VOC	
	GWM-08-4-R1	4/6/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-08-5-R1	4/5/2006	LDL VOC	
	GWM-08-6-R1	4/5/2006	LDL VOC	
GWP-10	GWP-10-R1	3/23/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	MS/MSD
GWP-11	GWP-11-R1	3/23/2006		
	GWP-21-R1			Duplicate of GWP-11-R1
GWX-10019	GWX-10019-R1	3/22/2006		
GWX-9398	GWX-9398-R1	3/23/2006		
GWX-10020	GWX-10020-R1	3/23/2006		
GWX-9953	GWX-9953-R1	3/24/2006		
GWX-9966	GWX-9966-R1	3/24/2006		
GWX-10035	GWX-10035-R1	3/24/2006		
GWX-8475	GWX-8475-R1	3/27/2006		
GWX-8474	GWX-8474-R1	3/27/2006		

Notes:

CN = cyanide

Fe^{+2} = ferrous iron

Hg = mercury

H_2S = hydrogen sulfide

LDL = low detection limit

MEE = methane, ethane, ethene

PCBs = polychlorinated biphenyl

R1 = round 1

SVOC = semi-volatile organic compound

TAL = target analyte list

TCL = target compound list

TOC = total organic carbon

VOC = volatile organic compound

MS/MSD = matrix spike/matrix spike duplicate

Table 2-4b
Summary of Multi-port Well, Existing Well, and Supply Well Samples - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
GWM-01	GWM-01-2-R2	7/12/2006	LDL VOC	
	GWM-01-3-R2	7/14/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-01-4-R2	7/12/2006	LDL VOC	
	GWM-01-5-R2	7/13/2006	LDL VOC	
	GWM-01-6-R2	7/13/2006	LDL VOC	
	GWM-01-7-R2	7/13/2006	LDL VOC	
	GWM-01-8-R2	7/13/2006	LDL VOC	
	GWM-01-9-R2	7/13/2006	LDL VOC	
	GWM-01-10-R2	7/13/2006	LDL VOC	
GWM-02	GWM-02-1-R2	7/13/2006	LDL VOC	
	GWM-02-2-R2	7/13/2006	LDL VOC	
	GWM-02-3-R2	7/13/2006	LDL VOC	
	GWM-02-4-R2	7/13/2006	LDL VOC	
	GWM-02-5-R2	7/13/2006	LDL VOC	
	GWM-02-6-R2	7/14/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-02-7-R2	7/13/2006	LDL VOC	
	GWM-02-8-R2	7/13/2006	LDL VOC	
	GWM-02-9-R2	7/13/2006	LDL VOC	
	GWM-02-10-R2	7/13/2006	LDL VOC	
GWM-03	GWM-03-1-R2	7/17/2006	LDL VOC	
	GWM-03-2-R2	7/17/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-03-3-R2	7/17/2006	LDL VOC	
	GWM-03-4-R2	7/17/2006	LDL VOC	
	GWM-03-5-R2	7/17/2006	LDL VOC	
	GWM-03-6-R2	7/17/2006	LDL VOC	
	GWM-03-7-R2	7/17/2006	LDL VOC	
GWM-04	GWM-04-1-R2	7/14/2006	LDL VOC	
	GWM-04-2-R2	7/14/2006	LDL VOC	
	GWM-04-3-R2	7/14/2006	LDL VOC	
	GWM-04-4-R2	7/14/2006	LDL VOC	
	GWM-04-5-R2	7/14/2006	LDL VOC	
	GWM-04-7-R2	7/17/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-04-8-R2	7/17/2006	LDL VOC	
	GWM-04-9-R2	7/17/2006	LDL VOC	
	GWM-04-10-R2	7/17/2006	LDL VOC	
GWM-05	GWM-05-1-R2	7/19/2006	LDL VOC	
	GWM-05-2-R2	7/19/2006	LDL VOC	
	GWM-05-3-R2	7/19/2006	LDL VOC	
	GWM-05-4-R2	7/19/2006	LDL VOC	
	GWM-05-5-R2	7/19/2006	LDL VOC	
	GWM-05-6-R2	7/18/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-05-7-R2	7/19/2006	LDL VOC	
	GWM-05-8-R2	7/19/2006	LDL VOC	
	GWM-05-9-R2	7/19/2006	LDL VOC	
	GWM-05-10-R2	7/19/2006	LDL VOC	
GWM-06	GWM-06-1-R2	7/19/2006	LDL VOC	
	GWM-06-2-R2	7/19/2006	LDL VOC	
	GWM-06-3-R2	7/19/2006	LDL VOC	
	GWM-06-4-R2	7/19/2006	LDL VOC	
	GWM-06-5-R2	7/20/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	MS/MSD
	GWM-06-6-R2	7/19/2006	LDL VOC	

Table 2-4b
Summary of Multi-port Well, Existing Well, and Supply Well Samples - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample Location	Sample ID	Date	Analysis	Comment
GWM-07	GWM-07-1-R2	7/11/2006	LDL VOC	
	GWM-07-2-R2	7/12/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	
	GWM-07-3-R2	7/11/2006	LDL VOC	
	GWM-07-4-R2	7/11/2006	LDL VOC	
	GWM-07-5-R2	7/11/2006	LDL VOC	
	GWM-07-6-R2	7/11/2006	LDL VOC	
GWM-08	GWM-08-1-R2	7/18/2006	LDL VOC	
	GWM-08-2-R2	7/18/2006	LDL VOC	
	GWM-08-3-R2	7/18/2006	LDL VOC	
	GWM-08-4-R2	7/18/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe+2, H2S, Soluble Mg)	
	GWM-08-4-R2-Dup			Duplicate of GWM-08-4-R2
	GWM-08-5-R2	7/18/2006	LDL VOC	
	GWM-08-6-R2	7/18/2006	LDL VOC	
GWP-10	GWP-10-R2	7/10/2006	LDL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Hg, CN, TOC, Sulfate, Nitrate, Chloride, MEE, and field screening parameters (Fe^{+2}, H_2S, Soluble Mg)	MS/MSD
GWP-11	GWP-11-R2	7/10/2006		
	GWP-11-R2-Dup			Duplicate of GWP-11-R2
GWX-10019	GWX-10019-R2	7/11/2006		
GWX-9398	GWX-9398-R2	7/12/2006		
GWX-10020	GWX-10020-R2	7/10/2006		
GWX-9953	GWX-9973-R2	7/12/2006		
GWX-9966	GWX-9966-R2	7/11/2006		
GWX-10035	GWX-10035-R2	7/11/2006		
GWX-8474	GWX-8475-R2	7/10/2006		
GWX-8475	GWX-8475-R2	7/10/2006		
GWX-8474	GWX-8474-R2	7/10/2006		

Notes:
CN = cyanide
GWM = monitoring well (groundwater)
Fe^{+2} = ferrous iron
Hg = mercury
H_2S = hydrogen sulfide
LDL = low detection limit
MEE = methane, ethane, ethene
PCBs = polychloride biphenyl
R2 = round 2
SVOC = semi-volatile organic compound
TAL = target analyte list
TCL = target compound list
TOC = total organic carbon
VOC = volatile organic compound
MS/MSD = matrix spike/matrix spike duplicate

Table 2-5
Existing Monitoring Well and Supply Well Construction Details
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Well ID/ Sample ID	Screen Interval	Well Diameter	Well Material	Location
Shallow Wells (Glacial Aquifer)				
GWX-9953	35-40	4	PVC	Hazelhurst Park, between Clinton Road and 100 Ring Road
GWX-9966	38-51	4	PVC	Southeast side of the Pembroke recharge basin
GWX-10035	48-53	4	PVC	Northeast corner of intersection of Clinton Road and Commercial Ave
GWX-9398	21-22	2	PVC	Corner of Prospect Ave and Meadow Street
Deep Wells (Magothy Aquifer)				
GWX-10019	223-228	4	PVC	Southwest of 300 Garden City Plaza
GWX-10020	185-190	4	PVC	Southeast of 300 Garden City Plaza
GWX-8068	265-291	4	PVC	585 Stewart Ave, at Ring Road ***[SAMPLED AT OUTSIDE VALVE]***
GWX-8474	485-556	4	PVC	Western side of Oak Street, north of intersection with Westbury Blvd. ***[BOTH WELLS ARE INSIDE PUMP HOUSE]***
GWX-8475	409-481			
GWP-10	377-417	18	steel	251 Clinton Avenue ***[EACH WELL IS LOCATED INSIDE A PUMP HOUSE]***
GWP-11	370-410	18	steel	

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Table 2-6
Summa Canister Pressure Readings
Old Roosevelt Field Contaminated Groundwater Site
Garden City, NY

Sample ID	Initial Canister Pressure (inches of Mercury)	Final Canister Pressure (inches of Mercury)
SGRF1	-25	0
SGRF2	-25	0
SGRF3	-28	0
SGRF4	-28	0
SGRF5	-28	0
SGRF6	-25	0
SGRF7	-26	0
SGRF8	-30	0
SGRF9	-26	0
SGRF12	-26	0
SGRF13	-29	0
SGRF14	-27	0
SGRF15	-27	0
SGRF16	-30	0
SGRF17	-29	0
SGRF18	-27	0
SGRF19	-25	0
SGRF20	-25	0
SGRF21	-25	0
SGRF22	-26	0
SGRF23	-26	0
SGRF24	-30	0
SGRF25	-25	0
SGRF26	-30	0
SGRF27	-25	0
SGRF28	-25	0
SGRF29	-25	0
SGRF30	-25	0
SGRF31	-25	0
SGRF32	-25	0
SGRF33	-30	0
SGRF34	-30	0
SGHP1*	-26	0
	-27	0
SGHP2	-29	2
SGHP3*	-26	-5
	-28	0
SGHP4	-27	-5

Notes:
* SGHP1 and SGHP3 were sampled twice as discussed in Section 2.2.3; the pressure readings listed are for the December and January samples, respectively.

SGRF9 is a duplicate of SGRF8

SGRF10 and SGRF11 were not collected due to underground utilities.

Table 3-1a
Groundwater Elevation Data: Multi-port Well Pressure Readings - March 2006 (Round 1) and July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Well ID	Port	Ground Surface Elevation (feet amsl)	Measurement Port Depth (feet BTOC)	Port Elevation (feet amsl)	Round 1 Atm. Pressure (psi)	Round 1 Fluid Pressure - Outside Casing (psi)	Round 1 Pressure Head (feet)	Round 1 Total Head (feet amsl)	Round 2 Atm. Pressure (psi)	Round 2 Fluid Pressure - Outside Casing (psi)	Round 2 Pressure Head (feet)	Round 2 Total Head (feet amsl)
SVP-1	1	86.58	455	-368.4	14.70	197.60	421.95	53.5	14.71	195.60	417.31	48.9
	2	86.58	408	-321.4	14.70	177.37	375.28	53.9	14.71	175.81	371.66	50.2
	3	86.58	378	-291.4	14.70	164.45	345.47	54.1	14.71	175.81	371.66	80.2
	4	86.58	323	-236.4	14.70	140.76	290.82	54.4	14.71	139.74	288.44	52.0
	5	86.58	298	-211.4	14.70	129.99	265.97	54.6	14.71	129.04	263.76	52.3
	6	86.58	258	-171.4	14.70	112.80	226.32	54.9	14.71	112.04	224.54	53.1
	7	86.58	208	-121.4	14.70	91.26	176.62	55.2	14.71	90.66	175.22	53.8
	8	86.58	158	-71.4	14.70	69.81	127.14	55.7	14.71	69.28	125.89	54.5
	9	86.58	108	-21.4	14.70	48.31	77.54	56.1	14.71	47.91	76.59	55.2
	10	86.58	58	28.6	14.70	26.78	27.87	56.4	14.71	26.50	27.20	55.8
SVP-2	1	89.39	455	-365.6	14.60	194.96	416.09	50.5	14.71	194.66	415.14	49.5
	2	89.39	418	-328.6	14.60	178.99	379.25	50.6	14.71	178.71	378.35	49.7
	3	89.39	378	-288.6	14.60	161.74	339.45	50.8	14.71	161.47	338.58	50.0
	4	89.39	338	-248.6	14.60	144.46	299.59	51.0	14.71	144.18	298.69	50.1
	5	89.39	298	-208.6	14.60	127.18	259.72	51.1	14.71	126.92	258.87	50.3
	6	89.39	258	-168.6	14.60	109.91	219.88	51.3	14.71	109.66	219.05	50.4
	7	89.39	198	-108.6	14.60	84.05	160.22	51.6	14.71	83.81	159.41	50.8
	8	89.39	158	-68.6	14.60	66.85	120.54	51.9	14.71	66.65	119.83	51.2
	9	89.39	108	-18.6	14.60	45.32	70.87	52.3	14.71	45.19	70.32	51.7
	10	89.39	58	31.4	14.60	23.70	20.99	52.4	14.71	23.55	20.39	51.8
SVP-3	1	87.17	455	-367.8	14.70	196.46	419.32	51.5	14.60	195.99	418.47	50.6
	2	87.17	398	-310.8	14.70	171.87	362.59	51.8	14.60	171.34	361.60	50.8
	3	87.17	378	-290.8	14.70	163.24	342.68	51.9	14.60	162.84	341.99	51.2
	4	87.17	298	-210.8	14.70	128.78	263.18	52.4	14.60	128.41	262.56	51.7
	5	87.17	178	-90.8	14.70	77.06	143.86	53.0	14.60	76.80	143.50	52.7
	6	87.17	108	-20.8	14.70	46.88	74.24	53.4	14.60	46.67	73.99	53.2
	7	87.17	58	29.2	14.70	25.27	24.38	53.6	14.60	25.07	24.15	53.3

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Table 3-1a
Groundwater Elevation Data: Multi-port Well Pressure Readings - March 2006 (Round 1) and July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

					Round 1				Round 2			
Well ID	Port	Ground Surface Elevation (feet amsl)	Measurement Port Depth (feet BTOC)	Port Elevation (feet amsl)	Atm. Pressure (psi)	Fluid Pressure - Outside Casing (psi)	Pressure Head (feet)	Total Head (feet amsl)	Atm. Pressure (psi)	Fluid Pressure - Outside Casing (psi)	Pressure Head (feet)	Total Head (feet amsl)
SVP-4	1	88.85	425	-336.2	14.89	182.75	387.25	51.1	14.25	182.11	387.25	51.1
	2	88.85	405	-316.2	14.89	174.10	367.30	51.1	14.25	173.47	367.32	51.2
	3	88.85	358	-269.2	14.89	153.85	320.58	51.4	14.25	184.40	392.54	123.4
	4	88.85	313	-224.2	14.89	134.41	275.73	51.6	14.25	133.85	275.92	51.8
	5	88.85	293	-204.2	14.89	125.80	255.87	51.7	14.25	125.16	255.87	51.7
	6	88.85	253	-164.2	14.89	108.56	216.10	51.9	14.25	108.02	216.33	52.2
	7	88.85	193	-104.2	14.89	82.71	156.46	52.3	14.25	82.27	156.92	52.8
	8	88.85	153	-64.2	14.89	65.46	116.66	52.5	14.25	65.06	117.22	53.1
	9	88.85	108	-19.2	14.89	46.02	71.82	52.7	14.25	45.65	72.44	53.3
	10	88.85	53	35.9	14.89	22.30	17.09	52.9	14.25	21.97	17.81	53.7
SVP-5	1	85.55	435	-349.5	14.65	187.80	399.46	50.0	14.68	251.51	546.37	196.9
	2	85.55	413	-327.5	14.65	178.36	377.68	50.2	14.68	176.74	373.87	46.4
	3	85.55	363	-277.5	14.65	156.77	327.87	50.4	14.68	155.10	323.95	46.5
	4	85.55	318	-232.5	14.65	137.34	283.05	50.6	14.68	135.77	279.35	46.9
	5	85.55	298	-212.5	14.65	128.70	263.11	50.7	14.68	127.25	259.70	47.2
	6	85.55	258	-172.5	14.65	111.49	223.41	51.0	14.68	110.27	220.53	48.1
	7	85.55	198	-112.5	14.65	85.76	164.05	51.6	14.68	85.17	162.62	50.2
	8	85.55	158	-72.5	14.65	68.57	124.39	51.9	14.68	68.24	123.56	51.1
	9	85.55	103	-17.5	14.65	44.91	69.81	52.4	14.68	44.86	69.63	52.2
	10	85.55	53	32.6	14.65	23.28	19.91	52.5	14.68	23.30	19.89	52.4
SVP-6	1	60.88	450	-389.1	14.88	198.70	424.07	35.0	14.60	198.01	423.13	34.0
	2	60.88	373	-312.1	14.88	165.77	348.10	36.0	14.60	165.32	347.71	35.6
	3	60.88	253	-192.1	14.88	114.23	229.20	37.1	14.60	113.86	228.99	36.9
	4	60.88	183	-122.1	14.88	82.59	156.21	34.1	14.60	83.83	159.71	37.6
	5	60.88	108	-47.1	14.88	54.57	91.56	44.4	14.60	54.49	92.03	44.9
	6	60.88	53	7.9	14.88	30.83	36.80	44.7	14.60	30.80	37.37	45.3

300923

Table 3-1a
Groundwater Elevation Data: Multi-port Well Pressure Readings - March 2006 (Round 1) and July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Well ID	Port	Ground Surface Elevation (feet amsl)	Measurement Port Depth (feet BTOC)	Port Elevation (feet amsl)	Round 1 Atm. Pressure (psi)	Round 1 Fluid Pressure - Outside Casing (psi)	Round 1 Pressure Head (feet)	Round 1 Total Head (feet amsl)	Round 2 Atm. Pressure (psi)	Round 2 Fluid Pressure - Outside Casing (psi)	Round 2 Pressure Head (feet)	Round 2 Total Head (feet amsl)
SVP-7	1	82.58	450	-367.4	14.71	193.10	411.55	44.1	14.83	192.41	409.68	42.3
	2	82.58	433	-350.4	14.71	185.77	394.64	44.2	14.83	185.10	392.81	42.4
	3	82.58	318	-235.4	14.71	136.40	280.74	45.3	14.83	135.96	279.45	44.0
	4	82.58	213	-130.4	14.71	91.44	177.02	46.6	14.83	91.23	176.25	45.8
	5	82.58	108	-25.4	14.71	46.20	72.65	47.2	14.83	46.10	72.14	46.7
	6	82.58	53	29.6	14.71	22.37	17.67	47.3	14.83	22.28	17.19	46.8
SVP-8	1	62.26	440	-377.7	14.53	193.62	413.16	35.4	14.71	191.10	406.93	29.2
	2	62.26	378	-315.7	14.53	167.15	352.09	36.4	14.71	165.00	346.72	31.0
	3	62.26	243	-180.7	14.53	110.11	220.50	39.8	14.71	109.12	217.80	37.1
	4	62.26	163	-100.7	14.53	76.76	143.56	42.8	14.71	76.68	142.96	42.2
	5	62.26	108	-45.7	14.53	53.16	89.12	43.4	14.71	53.27	88.96	43.2
	6	62.26	53	9.3	14.53	29.40	34.31	43.6	14.71	29.54	34.21	43.5

Notes:
amsl = above mean sea level
BTOC = below top of casing
Atm. = atmospheric
psi = pounds per square inch

300924

Table 3-1b
Groundwater Elevation Data: Existing Wells - March 2006 (Round 1) and July 2007 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Well ID	Well [1] Elevation	March 2006 (Round 1)		July 2006 (Round 2)	
		DTW [2]	Water Elevation [1]	DTW [2]	Water Elevation [1]
GWX-8474	74.79	- -	- -	- -	- -
GWX-8475	74.79	- -	- -	- -	- -
GWX-8068	NA[3]	- -	- -	- -	- -
GWX-10019	85.19	30.40	54.79	32.00	53.19
GWX-10020	81.85	27.05	54.80	28.20	53.65
GWX-10035	75.92	24.78	51.14	25.40	50.52
GWX-9398	63.23	15.85	47.38	16.00	47.23
GWX-9966	80.29	25.20	55.09	24.30	55.99
GWX-9953	92.69	35.90	56.79	36.50	56.19

Notes:
ID = Identification
DTW = Depth to water from inner well casing
- - = Not applicable. Well not measured.

[1] Well elevation and water table elevations are reported as feet above mean sea level; well elevation measurements were made from top of the inner casing.

[2] Depth to water measurements are reported as feet below the top of the inner casing.

[3] A well elevation was not able to be measured for GWX-8068. The well is inside a building and was not accessible during surveying.

Water level elevations are not available for existing wells GWX-8068, GWX-8474 and GWX-8475, and active pumping wells GWP-10 and GWP-11. These wells contain pumps and associated hardware, and therefore were not available for water level measurements.

300925

Table 4-1a
Groundwater Screening Criteria
Old Roosevelt Field Contaminated Groundwater Site
Garden City, NY

Chemical Name	USEPA National Primary Drinking Water Standards (Federal MCL) (1)			NYSDEC Standards (S) and Guidance (G) Values for Class GA Groundwater (2)			NYSDOH Drinking Water Quality Standards (3)		Site-Specific Groundwater Screening Criteria (SSGWSC) (4)
	Value	Note	G/S	Value	Note	G/S	Value	G/S	Value
VOCs									
1,1,1-Trichloroethane	200		S	5	PC	S	5	S	**5**
1,1,2,2-Tetrachloroethane	NL			5		S	5	S	**5**
1,1,2-Trichloro-1,2,2-trifluoroethane	NL			5	PC	S	NL		**5**
1,1,2-Trichloroethane	5		S	1		S	5	S	**1**
1,1-Dichloroethane	NL			5	PC	S	5	S	**5**
1,1-Dichloroethene	7		S	5	PC	S	5	S	**5**
1,2,3-Trichlorobenzene	NL			5	PC	S	5	S	**5**
1,2,4-Trichlorobenzene	70		S	5	PC	S	5	S	**5**
1,2-Dibromo-3-chloropropane	0.2		S	0.04		S	0.2	S	**0.04**
1,2-Dibromoethane	0.05		S	0.0006		S	0.05	S	**0.0006**
1,2-Dichlorobenzene	600		S	3		S	5	S	**3**
1,2-Dichloroethane	5		S	0.6		S	5	S	**0.6**
1,2-Dichloropropane	5		S	1		S	5	S	**1**
1,3-Dichlorobenzene	NL			3		S	5	S	**3**
1,4-Dichlorobenzene	75		S	3		S	5	S	**3**
2-Butanone	NL			*50*		*G*	NL		**50**
2-Hexanone	NL			*50*		*G*	50	S	**50**
4-Methyl-2-pentanone	NL			NL			50	S	**50**
Acetone	NL			*50*		*G*	50	S	**50**
Benzene	5		S	1		S	5	S	**1**
Bromochloromethane	NL			5	PC	S	5	S	**5**
Bromodichloromethane	80	T	S	*50*		*G*	100	S	**50**
Bromoform	80	T	S	*50*		*G*	100	S	**50**
Bromomethane	NL			5	PC	S	5	S	**5**
Carbon Disulfide	NL			*60*		*G*	50	S	**50**
Carbon Tetrachloride	5		S	5		S	5	S	**5**
Chlorobenzene	100		S	5	PC	S	5	S	**5**
Chloroethane	NL			5	PC	S	5	S	**5**
Chloroform	80	T	S	7		S	100	S	**7**
Chloromethane	NL			5	PC	S	5	S	**5**
cis-1,2-Dichloroethene	70		S	5	PC	S	5	S	**5**
cis-1,3-Dichloropropene	NL			0.4	J	S	5	S	**0.4**
Cyclohexane	NL			NL			NL		**NA**
Dibromochloromethane	80	T	S	*50*		*G*	100	S	**50**
Dichlorodifluoromethane	NL			5	PC	S	5	S	**5**
Ethylbenzene	700		S	5	PC	S	5	S	**5**
Isopropylbenzene	NL			5	PC	S	5	S	**5**
Methyl Acetate	NL			NL			NL		**NA**
Methyl Tert-Butyl Ether	NL			*10*		*G*	50	S	**10**
Methylcyclohexane	NL			NL			NL		**NA**
Methylene Chloride	5		S	5	PC	S	5	S	**5**
Styrene	100		S	5	PC	S	5	S	**5**
Tetrachloroethene	5		S	5	PC	S	5	S	**5**
Toluene	1,000		S	5	PC	S	5	S	**5**

Table 4-1a
Groundwater Screening Criteria
Old Roosevelt Field Contaminated Groundwater Site
Garden City, NY

Chemical Name	USEPA National Primary Drinking Water Standards (Federal MCL) (1)			NYSDEC Standards (S) and Guidance (G) Values for Class GA Groundwater (2)			NYSDOH Drinking Water Quality Standards (3)		Site-Specific Groundwater Screening Criteria (SSGWSC) (4)
	Value	Note	G/S	Value	Note	G/S	Value	G/S	Value
trans-1,2-Dichloroethene	100		S	5	PC	S	5	S	**5**
Trans-1,3-Dichloropropene	NL			0.4	J	S	5	S	**0.4**
Trichloroethene	5		S	5	PC	S	5	S	**5**
Trichlorofluoromethane	NL			5	PC	S	5	S	**5**
Vinyl Chloride	2		S	2		S	2	S	**2**
Xylenes (total)	10,000		S	5	PC	S	5	S	**5**
SVOCs									
1,1'Biphenyl	NL			5	PC	S	NL		**5**
2,2'-oxybis(1-Chloropropane)	NL			5	PC	S	NL		**5**
2,4,5-Trichlorophenol	NL			NL			5	S	**5**
2,4,6-Trichlorophenol	NL			NL			5	S	**5**
2,4-Dichlorophenol	NL			5	PC	S	NL		**5**
2,4-Dimethylphenol	NL			*50*		*G*	50	S	**50**
2,4-Dinitrophenol	NL			*10*		*G*	NL		**10**
2,4-Dinitrotoluene	NL			5	PC	S	50	S	**5**
2,6-Dinitrotoluene	NL			5	PC	S	50	S	**5**
2-Chloronaphthalene	NL			NL			5	S	**5**
2-Chlorophenol	NL			NL			5	S	**5**
2-Methylnaphthalene	NL			NL			NL		**NA**
2-Methylphenol	NL			NL			50	S	**50**
2-Nitroaniline	NL			5	PC	S	5	S	**5**
2-Nitrophenol	NL			NL			50	S	**50**
3,3'-Dichlorobenzidine	NL			5	PC	S	5	S	**5**
3-Nitroaniline	NL			5	PC	S	5	S	**5**
4,6-Dinitro-2-methylphenol	NL			NL			50	S	**50**
4-Bromophenyl-phenylether	NL			NL			50	S	**50**
4-Chloro-3-methylphenol	NL			NL			5	S	**5**
4-Chloroaniline	NL			5	PC	S	5	S	**5**
4-Chlorophenyl-phenylether	NL			NL			50	S	**50**
4-Methylphenol	NL			NL			50	S	**50**
4-Nitroaniline	NL			5	PC	S	5	S	**5**
4-Nitrophenol	NL			NL			50	S	**50**
Acenaphthene	NL			NL			50	S	**50**
Acenaphthylene	NL			NL			50	S	**50**
Acetophenone	NL			NL			50	S	**50**
Anthracene	NL			*50*		*G*	50	S	**50**
Atrazine	3		S	7.5		S	3	S	**3**
Benzaldehyde	NL			NL			NL		**NA**
Benzo(a)anthracene	NL			*0.002*		*G*	50	S	**0.002**
Benzo(a)pyrene	0.2		S	ND		S	0.2	S	**0.2**
Benzo(b)fluoranthene	NL			*0.002*		*G*	50	S	**0.002**
Benzo(g,h,i)perylene	NL			NL			50	S	**50**
Benzo(k)fluoranthene	NL			*0.002*		*G*	50	S	**0.002**
bis(2-Chloroethoxy)methane	NL			5	PC	S	5	S	**5**
bis(2-Chloroethyl)ether	NL			1		S	5	S	**1**

Table 4-1a
Groundwater Screening Criteria
Old Roosevelt Field Contaminated Groundwater Site
Garden City, NY

Chemical Name	USEPA National Primary Drinking Water Standards (Federal MCL) (1)			NYSDEC Standards (S) and Guidance (G) Values for Class GA Groundwater (2)			NYSDOH Drinking Water Quality Standards (3)		Site-Specific Groundwater Screening Criteria (SSGWSC) (4)
	Value	Note	G/S	Value	Note	G/S	Value	G/S	**Value**
bis(2-Ethylhexyl)phthalate	6		S	5		S	6	S	**5**
Butylbenzylphthalate	NL			*50*		G	50	S	**50**
Caprolactam	NL			NL			NL		**NA**
Carbazole	NL			NL			50	S	**50**
Chrysene	NL			*0.002*		G	50	S	**0.002**
Dibenz(a,h)anthracene	NL			NL			50	S	**50**
Dibenzofuran	NL			NL			50	S	**50**
Diethylphthalate	NL			*50*		G	50	S	**50**
Dimethylphthalate	NL			*50*		G	50	S	**50**
Di-n-butylphthalate	NL			50		S	NL		**50**
Di-n-octyl phthalate	NL			*50*		G	50	S	**50**
Fluoranthene	NL			*50*		G	50	S	**50**
Fluorene	NL			*50*		G	NL		**50**
Hexachlorobenzene	1		S	0.04		S	1	S	**0.04**
Hexachlorobutadiene	NL			0.5		S	5	S	**0.5**
Hexachlorocyclopentadiene	50		S	5	PC	S	5	S	**5**
Hexachloroethane	NL			5	PC	S	5	S	**5**
Indeno(1,2,3-cd)pyrene	NL			*0.002*		G	50	S	**0.002**
Isophorone	NL			*50*		G	50	S	**50**
Naphthalene	NL			NL			50	S	**50**
Nitrobenzene	NL			0.4		S	5	S	**0.4**
N-Nitroso-di-n-propylamine	NL			NL			50	S	**50**
N-Nitrosodiphenylamine	NL			*50*		G	50	S	**50**
Pentachlorophenol	1		S	NL			1	S	**1**
Phenanthrene	NL			*50*		G	50	S	**50**
Phenol	NL			NL			50	S	**50**
Pyrene	NL			*50*		G	50	S	**50**
P/PCBs									
4,4'-DDD	NL			0.3		S	5	S	**0.3**
4,4'-DDE	NL			0.2		S	NL		**0.2**
4,4'-DDT	NL			0.2		S	5	S	**0.2**
Aldrin	NL			ND		S	5	S	**5**
Alpha-BHC	NL			0.01		S	5	S	**0.01**
alpha-Chlordane	2	F	S	0.05	F	S	2	S	**0.05**
Aroclor-1016	0.5		S	0.09	C	S	0.5	S	**0.09**
Aroclor-1221	0.5		S	0.09	C	S	0.5	S	**0.09**
Aroclor-1232	0.5		S	0.09	C	S	0.5	S	**0.09**
Aroclor-1242	0.5		S	0.09	C	S	0.5	S	**0.09**
Aroclor-1248	0.5		S	0.09	C	S	0.5	S	**0.09**
Aroclor-1254	0.5		S	0.09	C	S	0.5	S	**0.09**
Aroclor-1260	0.5		S	0.09	C	S	0.5	S	**0.09**
Beta-BHC	NL			0.04		S	5	S	**0.04**
Delta-BHC	NL			0.04		S	5	S	**0.04**
Dieldrin	NL			0.004		S	5	S	**0.004**
Endosulfan I	NL			NL			50	S	**50**

Table 4-1a
Groundwater Screening Criteria
Old Roosevelt Field Contaminated Groundwater Site
Garden City, NY

Chemical Name	USEPA National Primary Drinking Water Standards (Federal MCL) (1)			NYSDEC Standards (S) and Guidance (G) Values for Class GA Groundwater (2)			NYSDOH Drinking Water Quality Standards (3)		Site-Specific Groundwater Screening Criteria (SSGWSC) (4)
	Value	Note	G/S	Value	Note	G/S	Value	G/S	Value
Endosulfan II	NL			NL			50	S	**50**
Endosulfan sulfate	NL			NL			50	S	**50**
Endrin	2		S	ND		S	2	S	**2**
Endrin aldehyde	NL			5	PC	S	5	S	**5**
Endrin ketone	NL			5	PC	S	NL		**5**
gamma-BHC (Lindane)	0.2		S	0.05		S	0.2	S	**0.05**
gamma-Chlordane	2	F	S	0.05	F	S	2	S	**0.05**
Heptachlor	0.4		S	0.04		S	0.4	S	**0.04**
Heptachlor epoxide	0.2		S	0.03		S	0.2	S	**0.03**
Methoxychlor	40		S	35		S	40	S	**35**
Toxaphene	3		S	0.06		S	3	S	**0.06**
Inorganics									
Aluminum	NL			NL			NL		**200***
Antimony	6		S	3		S	6	S	**3**
Arsenic	10		S	25		S	50	S	**10**
Barium	2,000		S	1,000		S	2,000	S	**1,000**
Beryllium	4		S	3		*G*	4	S	**3**
Cadmium	5		S	5		S	5	S	**5**
Calcium	NL			NL			NL		**11.6***
Chromium	100		S	50		S	100	S	**50**
Chromium (hexavalent)	NL			50		S			**50**
Cobalt	NL			NL			NL		**50***
Copper	1,300	TT	S	200		S	1,300	S	**200**
Cyanide	200		S	200		S	200	S	**200**
Iron	NL			NL			300	S	**300**
Lead	15	TT	S	25		S	15	S	**15**
Magnesium	NL			*35,000*		*G*	NL		**35,000**
Manganese	NL			NL			300	S	**300**
Mercury	2		S	0.7		S	2	S	**0.7**
Nickel	NL			100		S	NL		**100**
Potassium	NL			NL			NL		**5***
Selenium	50		S	10		S	50	S	**10**
Silver	NL			50		S	100	S	**50**
Sodium	NL			20,000		S	NL		**20,000**
Thallium	2		S	*0.5*		*G*	2	S	**0.5**
Vanadium	NL			NL			NL		**50***
Zinc	NL			*2,000*		*G*	5,000	S	**2,000**

Table 4-1a
Groundwater Screening Criteria
Old Roosevelt Field Contaminated Groundwater Site
Garden City, NY

Chemical Name	USEPA National Primary Drinking Water Standards (Federal MCL) (1)			NYSDEC Standards (S) and Guidance (G) Values for Class GA Groundwater (2)			NYSDOH Drinking Water Quality Standards (3)		Site-Specific Groundwater Screening Criteria (SSGWSC) (4)
	Value	Note	G/S	Value	Note	G/S	Value	G/S	Value

Notes:

(1) EPA National Primary Drinking Water Standards (Maximum Contaminant Levels) (web page), EPA 822-R-02-038, Summer 2002

(2) NYSDEC. June 1998. TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Includes April 2000 Addendum values.

(3) New York State Department of Health Drinking Water Standards

(4) Screening criteria is the lowest of the listed USEPA, NYSDEC, and NYDOH groundwater standards.

All VOC, SVOC, P/PCB and Inorganic values are in micrograms per liter (ug/L)

* No federal or state screening criteria or guidance value exists; value is either the CRQL for the Metals-AES Methodor the average of the results from Round 1 and Round 2, which ever is higher.

NYSDEC = New York State Department of Environmental Conservation

NYSDOH = New York State Department of Health

NA = not available

NL = chemical name not listed or screening value of this type not listed for the chemical

P/PCBs = pesticides and polychlorinated biphenyls

SSGWSC = site-specific groundwater screening criteria

SVOCs = semi-volatile organic compounds

μg/l = microgram per liter

VOCs = volatile organic compounds

C - Value applies to the sum of the PCB compounds

F - Value applies to the sum of alpha- and gamma-Chlordane

G - Guidance value only (italicized)

S - Standard Value

PC - Principal Organic Contaminant

T - Value applies to total trihalomethanes (bromodichloromethane, bromoform, chloroform, dibrimochloromethane)

TT - Treatment Technique

Table 4-1b
Soil Gas Screening Criteria
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name	Unit	EPA (1)
1,1,1-Trichloroethane	µg/m^3	220,000
1,1,2,2-Tetrachloroethane	µg/m^3	4.2
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/m^3	3,000,000
1,1,2-Trichloroethane	µg/m^3	15
1,1-Dichloroethane	µg/m^3	50,000
1,1-Dichloroethene	µg/m^3	20,000
1,2,4-Trichlorobenzene	µg/m^3	20,000
1,2,4-Trimethylbenzene	µg/m^3	600
1,2-Dibromoethane	µg/m^3	1.1
1,2-Dichlorobenzene	µg/m^3	11,000
1,2-Dichloroethane	µg/m^3	9
1,2-Dichloropropane	µg/m^3	400
1,2-Dichlorotetrafluoroethane;Fluorocarbon 114	µg/m^3	NA
1,3,5-Trimethyl Benzene	µg/m^3	600
1,3-Butadiene	µg/m^3	0.87
1,3-Dichlorobenzene	µg/m^3	11,000
1,4-Dichlorobenzene	µg/m^3	80,000
1,4-Dioxane	µg/m^3	NA
2,2,4-Trimethylpentane	µg/m^3	NA
2-Butanone	µg/m^3	NA
2-Hexanone	µg/m^3	NA
3-Chloropropene	µg/m^3	NA
4-Ethyltoluene	µg/m^3	NA
4-Methyl-2-pentanone	µg/m^3	NA
Acetone	µg/m^3	35,000
Benzene	µg/m^3	31
Benzyl Chloride	µg/m^3	5
Bromodichloromethane	µg/m^3	14
Bromoform	µg/m^3	220
Bromomethane	µg/m^3	NA
Carbon Disulfide	µg/m^3	70,000
Carbon Tetrachloride	µg/m^3	18
Chlorobenzene	µg/m^3	6,000
Chloroethane	µg/m^3	1,000,000
Chloroform	µg/m^3	11
Chloromethane	µg/m^3	NA
cis-1,2-Dichloroethene	µg/m^3	3,500
cis-1,3-Dichloropropene	µg/m^3	81
Cyclohexane	µg/m^3	NA
Dibromochloromethane	µg/m^3	NA
Dichlorodifluoromethane	µg/m^3	20,000
Ethanol	µg/m^3	NA

Table 4-1b
Soil Gas Screening Criteria
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name	Unit	EPA (1)
Ethylbenzene	μg/m^3	220
Hexachlorobutadiene	μg/m^3	11
Hexane	μg/m^3	20,000
Isopropyl Alcohol (Manufacturing-Strong Acid	μg/m^3	NA
Isopropylbenzene	μg/m^3	NA
Methyl tert-Butyl Ether	μg/m^3	300,000
Methylene Chloride	μg/m^3	520
m-Xylene	μg/m^3	700,000
n-Heptane	μg/m^3	NA
n-Propylbenzene	μg/m^3	14,000
o-Xylene	μg/m^3	700,000
Styrene	μg/m^3	100,000
Tetrachloroethene	μg/m^3	81
Tetrahydrofuran	μg/m^3	NA
Toluene	μg/m^3	40,000
trans-1,2-Dichloroethene	μg/m^3	7,000
trans-1,3-Dichloropropene	μg/m^3	81
Trichloroethene	μg/m^3	2.2
Trichlorofluoromethane	μg/m^3	70,000
Vinyl Chloride	μg/m^3	28

(1) Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002

Table 2C; risk = 10-6; deep soil gas; attenuation factor = 0.01

Table 4-2
Groundwater VOC Screening Results
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample ID	SVP-1 Screening Results									
	TCE	PCE	1,1,1-TCA	1,1-DCA	1,1-DCE	Freon 113	Acetone	Toluene	TCFM	MTBE
SVPGW01-50	ND	ND	ND	ND	ND	ND	12	7.1	12	7.6
SVPGW01-70	ND	ND	ND	ND	ND	ND	12	6.2	12	8.3
SVPGW01-90	ND	ND	ND	ND	ND	ND	8.3	2.4	24	8.5
SVPGW01-110	ND	ND	ND	1.2	ND	2.2	9.7	4.4	33	13
SVPGW01-130	ND	ND	ND	1	ND	ND	11	15	15	9.7
SVPGW01-150	ND	ND	ND	1.2	ND	1.9	11	11	34	15
SVPGW01-170	ND	ND	ND	1.2	ND	1.8	ND	8.4	42	18
SVPGW01-190	ND	ND	ND	1.4	ND	ND	ND	11	37	15
SVPGW01-210	ND	ND	ND	ND	ND	ND	ND	8	38	16
SVPGW01-230	ND	ND	ND	2.6	ND	4.8	ND	4.3	100	27
SVPGW01-250	ND	ND	ND	1.6	ND	3	ND	6.6	61	19
SVPGW01-270	ND	ND	ND	1.4	ND	1.9	ND	7.7	42	16
SVPGW01-290	ND	ND	ND	ND	ND	4	ND	4.1	87	20
SVPGW01-310	ND	ND	ND	ND	ND	3.2	ND	4	70	20
SVPGW01-330	ND	ND	ND	ND	ND	3	ND	4.5	72	19
SVPGW01-350	ND	ND	ND	2.4	ND	3.1	ND	4.8	79	19
SVPGW01-370	1.2	ND	1.3	3.4	1.7	2.3	7	2.8	70	14
SVPGW01-390	ND	1	ND	2.4	ND	2.9	14	5.7	75	19
SVPGW01-410	ND	ND	ND	1.8	ND	2	9.1	6.2	59	17
SVPGW01-430	ND	ND	ND	1.3	ND	2.9	6.5	8.1	59	16
SVPGW01-450	ND	ND	ND	1.6	ND	2.1	16	5.1	54	17

Abbreviations:

DCA - Dichloroethane
DCE - Dichloroethene
MTBE - Methyl tert-butyl ether
PCE - Tetrachloroethene
ND - not detected
SVPGW - vertical profile groundwater screening
TCA - Trichloroethane
TCE - Trichloroethene
TCFM - Trichlorofluoromethane
VOC - Volatile Organic Compound

All results in micrograms per liter (μg/L)

300933

Table 4-2
Groundwater VOC Screening Results
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample ID	SVP-2 Screening Results						
	TCE	TCFM	Dichlorofluoromethane	Cis-1,2-DCE	1,1,2-Trichloro 1,2,2-Trifluoroethane	Acetone	Toluene
SVPGW02-50	6	ND	ND	ND	ND	ND	ND
SVPGW02-70	18	ND	ND	ND	ND	ND	ND
SVPGW02-90	21	ND	7	ND	ND	ND	ND
SVPGW02-110	16	ND	6	ND	ND	6	7
SVPGW02-130	20	ND	ND	ND	ND	ND	ND
SVPGW02-150	28	ND	6	ND	ND	ND	ND
SVPGW02-170	18	10	7	ND	ND	ND	ND
SVPGW02-170 D	18	11	6	ND	ND	ND	ND
SVPGW02-190	24	17	8	6	ND	6	7
SVPGW02-210	20	16	ND	6	ND	ND	ND
SVPGW02-230	24	37	8	6	ND	ND	ND
SVPGW02-250	37	35	ND	16	ND	ND	ND
SVPGW02-270	23	39	10	6	ND	ND	ND
SVPGW02-290	26	46	11	9	ND	ND	ND
SVPGW02-310	19	96	ND	8	ND	ND	ND
SVPGW02-330	15	100	ND	ND	ND	ND	ND
SVPGW02-350	15	120	ND	ND	ND	ND	ND
SVPGW02-350 D	15	120	ND	ND	ND	ND	ND
SVPGW02-370	13	140	ND	ND	ND	6	ND
SVPGW02-390	10	190	ND	ND	ND	7	ND
SVPGW02-410	12	270	ND	ND	8	10	7
SVPGW02-430	16	690	ND	ND	19	6	ND
SVPGW02-450	27	1900	ND	ND	51	ND	ND

Abbreviations:
DCE - Dichloroethene
SVPGW - vertical profile groundwater screening
TCE - Trichloroethene
TCFM - Trichlorofluoromethane
VOC - Volatile Organic Compound
ND - not detected

All results in micrograms per liter (μg/L)

300934

Table 4-2
Groundwater VOC Screening Results
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample ID	SVP-3 Screening Results						
	TCE	Acetone	Dichlorodifluoromethane	TCFM	1,1-DCA	1,1-DCE	Toluene
SVPGW03-50	ND	13	ND	ND	ND	ND	13
SVPGW03-70	ND	8	ND	ND	ND	ND	9
SVPGW03-90	ND	ND	ND	ND	ND	ND	ND
SVPGW03-110	ND	ND	ND	ND	ND	ND	ND
SVPGW03-130	ND	ND	8	ND	ND	ND	ND
SVPGW03-130D	ND	ND	7	ND	ND	ND	ND
SVPGW03-150	ND	ND	9	ND	ND	ND	ND
SVPGW03-170	ND	ND	12	ND	ND	ND	ND
SVPGW03-190	ND	ND	12	ND	ND	ND	ND
SVPGW03-210	ND	ND	9	ND	ND	ND	ND
SVPGW03-230	ND	6	7	ND	ND	ND	ND
SVPGW03-250	ND	9	6	ND	ND	ND	ND
SVPGW03-270	ND	10	5	ND	ND	ND	ND
SVPGW03-290	ND	ND	10	ND	ND	ND	ND
SVPGW03-310	ND	6	6	ND	ND	ND	ND
SVPGW03-330	ND	6	8	ND	ND	ND	ND
SVPGW03-350	ND	ND	ND	ND	ND	ND	ND
SVPGW03-370	8	ND	ND	8	ND	ND	ND
SVPGW03-390	3.2 J	ND	5.2 J	15	3.4 J	1.4 J	ND
SVPGW03-390D	3.2 J	ND	5.7 J	14	3.4 J	1.4 J	ND
SVPGW03-410	ND	ND	4.7 J	5 J	1.8 J	ND	ND
SVPGW03-430	ND	ND	5.7 J	5.9 J	2 J	ND	1.3 J
SVPGW03-450	1.5 J	ND	4.2 J	16	1.5 J	ND	2.1 J

Abbreviations:
DCA - Dichloroethane
DCE - Dichloroethene
SVPGW - vertical profile groundwater screening
ND - not detected
TCE - Trichloroethene
TCFM - Trichlorofluoromethane
VOC - Volatile Organic Compound
J - estimated value

All results in micrograms per liter (µg/L)

Table 4-2
Groundwater VOC Screening Results
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

	SVP-4 Screening Results				
Sample ID	PCE	TCE	cis-1,2-DCE	TCFM	Acetone
SVPGW-04-49	14	ND	ND	ND	23
SVPGW-04-69	21	ND	ND	ND	17
SVPGW-04-89	25	ND	ND	ND	10
SVPGW-04-109	23	ND	ND	ND	7
SVPGW-04-129	8	ND	ND	ND	15
SVPGW-04-149	58	110	ND	ND	13
SVPGW-04-169	78	130	ND	ND	11
SVPGW-04-189	110	140	ND	ND	10
SVPGW-04-209	61	80	ND	ND	17
SVPGW-04-229	50	68	ND	ND	15
SVPGW-04-249	78	100	ND	ND	11
SVPGW-04-269	64	110	6	ND	15
SVPGW-04-289	31	110	7	ND	12
SVPGW-04-309	16	88	6	ND	11
SVPGW-04-329	10	65	6	8	7
SVPGW-04-349	6	63	7	9	8
SVPGW-04-369	ND	54	7	10	6
SVPGW-04-389	ND	53	6	10	8
SVPGW-04-409	ND	56	7	14	ND
SVPGW-04-423	ND	ND	ND	23	8
SVPGW-04-449	NA	NA	NA	NA	NA

	SVP-5 Screening Results		
Sample ID	TCE	Acetone	Dichlorodifluoromethane
SVPGW-05-50	ND	8	ND
SVPGW-05-70	ND	6	ND
SVPGW-05-90	ND	8	ND
SVPGW-05-110	6	6	ND
SVPGW-05-130	7	10	ND
SVPGW-05-150	11	12	ND
SVPGW-05-170	ND	19	ND
SVPGW-05-190	ND	17	ND
SVPGW-05-210	ND	16	ND
SVPGW-05-230	11	ND	6
SVPGW-05-250	19	12	ND
SVPGW-05-270	11	17	7
SVPGW-05-290	11	17	ND
SVPGW-05-310	8	20	8
SVPGW-05-330	6	12	ND
SVPGW-05-350	12	10	10
SVPGW-05-370	10	10	12
SVPGW-05-390	8	12	6
SVPGW-05-410	9	13	ND
SVPGW-05-430	7	16	ND
SVPGW-05-450	ND	23	ND

Abbreviations:
DCE - Dichloroethene
PCE - Tetrachloroethene
SVPGW - vertical profile groundwater screening
ND - not detected
TCE - Trichloroethene
TCFM - Trichlorofluoromethane
VOC - Volatile Organic Compound

All results in micrograms per liter (µg/L)

300936

CDM

Table 4-2
Groundwater VOC Screening Results
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample ID	SVP-6 Screening Results					
	1,1-DCE	cis-1,2-DCE	1,1,1-TCA	1,1-DCA	Acetone	Toluene
SVPGW06-50	9	6	10	ND	ND	10
SVPGW06-70	9	6	10	ND	ND	10
SVPGW06-90	16	10	16	7	7	30
SVPGW06-110	6	ND	6	ND	ND	10
SVPGW06-130	7	ND	6	ND	ND	9
SVPGW06-130D	8	ND	ND	ND	ND	8
SVPGW06-150	10	8	12	ND	ND	9
SVPGW06-170	11	8	13	ND	ND	6
SVPGW06-190	8	6	10	ND	ND	16
SVPGW06-210	ND	ND	ND	ND	ND	6
SVPGW06-230	ND	ND	ND	ND	ND	ND
SVPGW06-250	ND	ND	ND	ND	ND	ND
SVPGW06-270	ND	ND	ND	ND	ND	ND
SVPGW06-290	ND	ND	ND	ND	ND	ND
SVPGW06-310	ND	ND	ND	ND	ND	ND
SVPGW06-330	ND	ND	ND	ND	ND	ND
SVPGW06-350	ND	ND	ND	ND	ND	ND
SVPGW06-370	ND	ND	ND	ND	ND	ND
SVPGW06-390	ND	ND	ND	ND	7	ND
SVPGW06-410	ND	ND	ND	ND	ND	7
SVPGW06-430	ND	ND	ND	ND	8	7
SVPGW06-450	ND	ND	ND	ND	7	25

Abbreviations:
DCA - Dichloroethane
DCE - Dichloroethene
SVPGW - vertical profile groundwater screening
ND - not detected
TCA - Trichloroethane
TCE - Trichloroethene
VOC - Volatile Organic Compound

All results in micrograms per liter (µg/L)

Table 4-2
Groundwater VOC Screening Results
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Sample ID	SVP-7 Screening Results			
	TCE	cis-1,2-DCE	Acetone	Toluene
SVPGW07-50	3.2	ND	5.5	28.0
SVPGW07-70	2.5	ND	ND	6.6
SVPGW07-90	4.4	ND	ND	7.2
SVPGW07-110	3.9	ND	ND	13.0
SVPGW07-130	4.1	ND	ND	8.9
SVPGW07-150	4.8	ND	ND	9.9
SVPGW07-170	4.7	ND	ND	7.8
SVPGW07-190	5.0	ND	ND	4.1
SVPGW07-210	5.2	ND	ND	3.2
SVPGW07-230	4.4	ND	ND	1.3
SVPGW07-250	5.4	ND	ND	1.3
SVPGW07-270	5.1	ND	ND	1.3
SVPGW07-290	5.4	ND	ND	1.2
SVPGW07-310	4.3	ND	ND	1.2
SVPGW07-330	4.3	ND	ND	2.4
SVPGW07-350	4.0	ND	ND	2.5
SVPGW07-370	4.8	ND	ND	ND
SVPGW07-390	7.7	1.1	ND	ND
SVPGW07-410	5.9	ND	ND	ND
SVPGW07-430	10.0	1.8	ND	ND
SVPGW07-450	4.4	ND	ND	ND

Sample ID	SVP-8 Screening Results	
	Acetone	Toluene
SVPGW08-50	7	35
SVPGW08-70	9	130
SVPGW08-90	6	33
SVPGW08-110	8	71
SVPGW08-130	8	63
SVPGW08-150	6	16
SVPGW08-170	6	35
SVPGW08-190	ND	17
SVPGW08-210	6	13
SVPGW08-210D	6	14
SVPGW08-230	8	11
SVPGW08-250	8	11
SVPGW08-270	8	ND
SVPGW08-290	12	ND
SVPGW08-310	9	ND
SVPGW08-330	8	ND
SVPGW08-350	8	ND
SVPGW08-370	7	ND
SVPGW08-370D	ND	ND
SVPGW08-390	ND	ND
SVPGW08-410	ND	ND
SVPGW08-430	ND	ND
SVPGW08-450	ND	ND

Abbreviations:
DCE - Dichloroethene
SVPGW - vertical profile groundwater screening
TCE - Trichloroethene
VOC - Volatile Organic Compound
ND - not detected

All results in micrograms per liter (μg/L)

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Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

		GWM-1 (background)								
		Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8	Port 9	Port 10
Chemical Name		400 to 405 ft	370 to 375 ft	315 to 320 ft	290 to 295 ft	250 to 255 ft	200 to 205 ft	150 to 155 ft	100 to 105 ft	50 to 55 ft
LDL VOCs	SSGWSC	GWM-01-2	GWM-01-3	GWM-01-4	GWM-01-5	GWM-01-6	GWM-01-7	GWM-01-8	GWM-01-9	GWM-01-10
Tetrachloroethene	**5**	**0.21 J**	**0.24 J**	**0.38 J**	**0.28 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Trichloroethene	**5**	**0.3 J**	**0.77**	**0.5**	**0.32 J**	**0.49 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
1,1-Dichloroethene	**5**	**0.32 J**	**0.32 J**	**0.64**	**0.55 J**	**0.61**	**0.12 J**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**1.3 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Carbon Tetrachloride	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**1.3 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.5 UJ	0.5 U	0.5 UJ	1.3 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Chloromethane	5	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	5	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	6.5	0.37 J	6.8	24	140	1.8	0.32 J	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.19 J	0.5 U	0.13 J	0.77 J	3.6	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 R	13 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	1	0.5 U	0.5 U	1.3 U	0.5 UJ	0.5 UJ	0.92 UJ	0.5 UJ	0.5 UJ
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	1.3 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Methyl tert-Butyl Ether	10	1	0.5 U	1.5	8.2	30	0.84	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	5	1.1	2.7	1.8	0.98 J	1.7	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	50	5 U	5 U	5 R	13 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7	0.12 J	0.5 U	0.2 J	1.3 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
1,1,1-Trichloroethane	5	0.38 J	0.93	0.51	0.26 J	0.38 J	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes (total)	5	0.5 U	0.5 U	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	1.3 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (μg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

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Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

		GWM-2									
		Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8	Port 9	Port 10
Chemical Name		450 to 455 ft	410 to 415 ft	370 to 375 ft	330 to 335 ft	290 to 295 ft	250 to 255 ft	190 to 195 ft	150 to 155 ft	100 to 105 ft	50 to 55 ft
LDL VOCs	SSGWSC	GWM-02-1	GWM-02-2	GWM-02-3	GWM-02-4	GWM-02-5	GWM-02-6	GWM-02-7	GWM-02-8	GWM-02-9	GWM-02-10
Tetrachloroethene	**5**	**2.4**	**1.4**	**1.6**	**2.8**	**5.8**	**1.8**	**3.2**	**2.8**	**0.86**	**0.68**
Trichloroethene	**5**	**22**	**13**	**16**	**23**	**24**	**25**	**18**	**25**	**20**	**4.9**
1,1-Dichloroethene	**5**	**0.5 U**	**0.46 J**	**0.41 J**	**0.5 U**	**0.5 U**	**1 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**0.97**	**0.86**	**2.7**	**5.2**	**4.9**	**8.4**	**0.29 J**	**0.36 J**	**0.8**	**0.69**
Carbon Tetrachloride	**5**	**0.14 J**	**0.13 J**	**0.5 U**	**0.5 U**	**0.1 J**	**1 U**	**0.16 J**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	6.6	4.7	3.5	3.9	10	2.9 J	7.5	6.9	3.2	2.2
Chloromethane	5	0.31 J	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.19 J
Chloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	1.2	58	0.95	0.96	3.1	0.36 J	0.55	0.33 J	0.43 J	0.39 J
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	1.2 J	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	0.14 J	0.5 U	0.5 U	0.15 J	0.5 U	1 U	0.5 U	0.5 U	0.38 J	0.7
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.19 J	0.26 J	0.24 J	0.81 J	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.96	0.34 J	0.37 J	0.6	0.43 J	0.82 J	0.44 J	1.4	3	0.24 J
1,1-Dichloroethane	5	0.12 J	1.2	1.1	0.26 J	0.17 J	0.24 J	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	10 U	5 U	5 U	5 U	5 U
Chloroform	7	0.45 J	0.62	0.31 J	0.34 J	0.24 J	1 U	0.34 J	0.22 J	0.5 U	0.5 U
1,1,1-Trichloroethane	5	0.5 U	0.24 J	0.31 J	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes (total)	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (µg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-3 Port 1 450 to 455 ft GWM-03-1		Port 2 390 to 395 ft GWM-03-2		Port 3 370 to 375 ft GWM-03-3		Port 4 290 to 295 ft GWM-03-4		Port 5 170 to 175 ft GWM-03-5		Port 6 100 to 105 ft GWM-03-6		Port 7 50 to 55 ft GWM-03-7	
Tetrachloroethene	5	0.2	J	0.39	J	0.25	J	0.54		0.39	J	0.65		0.72	
Trichloroethene	5	1.9		3.3		8.9		0.5	U	0.4	J	0.5	U	0.5	U
1,1-Dichloroethene	5	0.11	J	0.84		0.27	J	0.12	J	0.15	J	0.23	J	0.5	U
cis-1,2-Dichloroethene	5	0.5	U	0.25	J	0.39	J	0.5	U	0.5	U	0.5	U	0.5	U
Carbon Tetrachloride	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Dichlorodifluoromethane	5	0.5	U	0.48	J	0.17	J	0.22	J	1.9		0.5	U	0.5	U
Chloromethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichlorofluoromethane	5	20		6.8		7.1		0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.3	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acetone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Carbon Disulfide	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,2-Dichloroethene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl tert-Butyl Ether	10	0.5	U	0.5	U	0.5	U	0.5	U	1.6		0.44	J	0.5	U
1,1-Dichloroethane	5	0.41	J	3.5		2.6		0.25	J	0.74		0.66		0.18	J
2-Butanone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chloroform	7	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-Trichloroethane	5	0.28	J	0.87		0.89		0.62		0.43	J	0.91		0.95	
Benzene	1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Ethylbenzene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Xylenes (total)	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,4-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (µg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
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ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-4																			
		Port 1 420 to 425 ft GWM-04-1		Port 2 400 to 405 ft GWM-04-2		Port 3 350 to 355 ft GWM-04-3		Port 4 305 to 310 ft GWM-04-4		Port 5 285 to 290 ft GWM-04-5		Port 6 245 to 250 ft GWM-04-6		Port 7 185 to 190 ft GWM-04-7		Port 8 145 to 150 ft GWM-04-8		Port 9 100 to 105 ft GWM-04-9		Port 10 45 to 50 ft GWM-04-10	
Tetrachloroethene	5	**7.3**		**20**		**21**		**180**		**220**		**350**		**14**		**41**		**15**		**0.37**	**J**
Trichloroethene	5	**30**		**26**		**64**		**280**		**260**		**220**		**260**		**90**		**2.7**		**1.3**	
1,1-Dichloroethene	5	**1.2**		**1.7**		**1.3**	**J**	**8.9**		**7.8**		**5.5**	**J**	**2.2**	**J**	**0.57**		**0.5**	**U**	**0.5**	**U**
cis-1,2-Dichloroethene	5	**0.41**	**J**	**0.82**	**J**	**1.4**	**J**	**3.9**	**J**	**3.6**	**J**	**5.3**	**J**	**2.2**	**J**	**2.3**		**0.89**		**0.1**	**J**
Carbon Tetrachloride	5	**0.4**	**J**	**1.3**		**2.5**	**U**	**8.4**	**U**	**6.3**	**U**	**13**	**U**	**6.3**	**U**	**0.1**	**J**	**0.5**	**U**	**0.5**	**U**
Dichlorodifluoromethane	5	1	UJ	1	UJ	5.2	J	97	J	64	J	15	J	4.3	J	2.7	J	0.67	J	0.5	UJ
Chloromethane	5	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
Chloroethane	5	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
Trichlorofluoromethane	5	31		16		2.8		8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	1	UJ	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
Acetone	50	10	U	11	U	32	U	120	U	83	U	160	U	87	U	5	U	5	U	5	U
Carbon Disulfide	50	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	1	UJ	1.6	U	2	J	3.8	J	2.3	J	13	UJ	1.8	J	0.5	U	0.5	U	0.5	U
trans-1,2-Dichloroethene	5	1	UJ	1	UJ	2.5	UJ	8.4	UJ	6.3	UJ	13	UJ	6.3	UJ	0.5	U	0.5	U	0.5	U
Methyl tert-Butyl Ether	10	3.4		1.7		6.5		10		12		17		45		27		0.32	J	0.5	U
1,1-Dichloroethane	5	2.7		3.3		2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
2-Butanone	50	10	U	10	U	25	U	84	U	63	U	130	U	63	U	5	U	5	U	5	U
Chloroform	7	1.7	UJ	2.4	UJ	2.5	UJ	8.4	UJ	6.3	UJ	13	UJ	6.3	UJ	0.5	U	0.5	U	0.5	U
1,1,1-Trichloroethane	5	0.85	J	1.2		2.5	U	2.4	J	2.3	J	13	U	6.3	U	0.27	J	0.5	U	0.5	U
Benzene	1	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.22	J	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.4	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
Toluene	5	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
Ethylbenzene	5	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
Xylenes (total)	5	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U
1,4-Dichlorobenzene	3	1	U	1	U	2.5	U	8.4	U	6.3	U	13	U	6.3	U	0.5	U	0.5	U	0.5	U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (μg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

300942

Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-5 Port 1 430 to 435 ft GWM-05-1	Port 2 405 to 410 ft GWM-05-2	Port 3 355 to 360 ft GWM-05-3	Port 4 310 to 315 ft GWM-05-4	Port 5 290 to 295 ft GWM-05-5	Port 6 250 to 255 ft GWM-05-6	Port 7 190 to 195 ft GWM-05-7	Port 8 150 to 155 ft GWM-05-8	Port 9 95 to 100 ft GWM-05-9	Port 10 45 to 50 ft GWM-05-10
Tetrachloroethene	**5**	**0.5**	**0.95**	**0.55**	**0.72**	**0.62**	**0.31 J**	**0.5**	**0.33 J**	**0.81**	**0.11 J**
Trichloroethene	**5**	**6.6**	**32**	**12**	**14**	**19**	**5**	**2.6**	**0.91**	**4.4**	**0.11 J**
1,1-Dichloroethene	**5**	**1**	**1**	**0.37 J**	**0.4 J**	**0.44 J**	**0.5 U**	**2.7**	**2.8**	**1.2**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**0.56**	**1.8**	**0.97**	**1.1**	**1.7**	**0.58**	**0.23 J**	**0.12 J**	**0.34 J**	**0.5 U**
Carbon Tetrachloride	**5**	**0.18 J**	**0.25 J**	**0.17 J**	**0.5 U**	**0.12 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	1.8	2	22	17	3.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.19 J
Chloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	0.5 U	1.2	0.37 J	0.46 J	0.56	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.5 U	0.5 U	0.8	1.8	1.1	0.7	0.5	0.85	0.85	0.7
1,1-Dichloroethane	5	1.6	1.8	2	3	1.8	0.7	4.4	4.7	3.1	0.5 U
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.27 J	0.24 J	0.5 U
1,1,1-Trichloroethane	5	0.57	0.57	0.15 J	0.18 J	0.26 J	0.2 J	1.6	1.5	0.52	0.5 U
Benzene	1	0.5 U	0.5 U	0.12 J	0.11 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.1 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes (total)	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (μg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

300943

Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-6 Port 1 445 to 450 ft GWM-06-1	Port 2 365 to 370 ft GWM-06-2	Port 3 245 to 250 ft GWM-06-3	Port 4 175 to 180 ft GWM-06-4	Port 5 100 to 105 ft GWM-06-5	Port 6 45 to 50 ft GWM-06-6	Duplicate
Tetrachloroethene	**5**	**0.23 J**	**0.5 U**	**0.7**	**0.52**	**1.1**	**0.5 U**	**0.11 J**
Trichloroethene	**5**	**1.7**	**0.33 J**	**8.2**	**2.1**	**4.3**	**0.26 J**	**0.29 J**
1,1-Dichloroethene	**5**	**6.6**	**3.7**	**13**	**14**	**22**	**1.5**	**1.2**
cis-1,2-Dichloroethene	**5**	**1.8**	**0.69**	**4.8 J**	**4.1 J**	**22 J**	**0.26 J**	**0.32 J**
Carbon Tetrachloride	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.59	0.29 J	0.58	0.36 J	0.75	0.5 U	0.5 U
Chloromethane	5	0.24 J	0.47 J	2.5	0.5 U	0.5 U	0.76 J	0.5 U
Chloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	3.3	0.5 U	0.5 U
Trichlorofluoromethane	5	0.5 U	0.13 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.15 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	12	21	9.8	28	9.6	43	29
Carbon Disulfide	50	1.5	0.6	0.94	0.25 J	0.35 J	0.66 J	0.35 J
Methylene Chloride	5	1.1 U	0.5 U	0.38 J	0.56 J	0.84	0.5 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.5 U	0.5 U	0.17 J	0.2 J	0.34 J	0.15 J	0.5 U
1,1-Dichloroethane	5	2	0.99	3.8	6.5	15	0.25 J	0.31 J
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	5 U	4.3 J
Chloroform	7	0.5	0.11 J	0.55	0.53	2.1	0.5 U	0.5 U
1,1,1-Trichloroethane	5	7.4	3	14	15	21	1.7	2.3
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.11 J	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	8.5	6.6	110	42	23	790	810
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.47 J	0.59
Xylenes (total)	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.27 J
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.25 J	0.27 J

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (µg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

300944

Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-7 Port 1 445 to 450 ft GWM-07-1		Port 2 425 to 430 ft GWM-07-2		Port 3 310 to 315 ft GWM-07-3		Port 4 205 to 210 ft GWM-07-4		Port 5 100 to 105 ft GWM-07-5		Port 5 100 to 105 ft Duplicate		Port 6 45 to 50 ft GWM-07-6	
Tetrachloroethene	**5**	**0.5**	**U**	**0.11**	**J**	**2.2**		**0.21**	**J**	**0.45**	**J**	**0.7**		**0.5**	**U**
Trichloroethene	**5**	**0.18**	**J**	**0.66**		**9.4**		**0.38**	**J**	**1.2**		**1.8**		**0.5**	**U**
1,1-Dichloroethene	**5**	**0.18**	**J**	**1.4**		**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
cis-1,2-Dichloroethene	**5**	**0.5**	**U**	**0.5**	**U**	**1**		**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
Carbon Tetrachloride	**5**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
Dichlorodifluoromethane	5	0.14	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloromethane	5	0.14	J	0.5	U	0.5	U	0.16	J	0.14	J	0.23	J	0.5	U
Chloroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichlorofluoromethane	5	0.5	U	0.5	U	0.42	J	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acetone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Carbon Disulfide	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	0.79	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
trans-1,2-Dichloroethene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl tert-Butyl Ether	10	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
2-Butanone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chloroform	7	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-Trichloroethane	5	0.5	U	0.66		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Benzene	1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	5	0.56	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Ethylbenzene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Xylenes (total)	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,4-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (µg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

300945

Table 4-3
Multi-Port Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-8 Port 1 435 to 440 ft GWM-08-1	Port 2 370 to 375 ft GWM-08-2	Port 3 235 to 240 ft GWM-08-3	Port 4 155 to 160 ft GWM-08-4	Port 5 100 to 105 ft GWM-08-5	Port 6 45 to 50 ft GWM-08-6
Tetrachloroethene	**5**	**1.9**	**1.9**	**15**	**17**	**34**	**0.92**
Trichloroethene	**5**	**1.9**	**1.5**	**1.2**	**1**	**1.6**	**0.5 U**
1,1-Dichloroethene	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**0.21 J**	**0.18 J**	**0.5 U**	**0.5 U**	**0.18 J**	**0.5 U**
Carbon Tetrachloride	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.5 U	0.33 J	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.13 J	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes (total)	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (μg/L)
Site-related VOCs are bolded
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

300946

Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

		GWM-1 (background)								
		Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8	Port 9	Port 10
Chemical Name		400 to 405 ft	370 to 375 ft	315 to 320 ft	290 to 295 ft	250 to 255 ft	200 to 205 ft	150 to 155 ft	100 to 105 ft	50 to 55 ft
LDL VOCs	SSGWSC	GWM-01-2	GWM-01-3	GWM-01-4	GWM-01-5	GWM-01-6	GWM-01-7	GWM-01-8	GWM-01-9	GWM-01-10
Tetrachloroethene	**5**	**0.7**	**0.8**	**0.8**	**0.21 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Trichloroethene	**5**	**0.99**	**2.4**	**0.92**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
1,1-Dichloroethene	**5**	**0.5 U**	**4**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**0.13 J**	**0.22 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Carbon Tetrachloride	**5**	**0.5 U**	**0.49 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.5 R	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	1	4.2	16	20	10	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.72	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	1.6 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 R	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Acetate	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	0.5 U	0.78	0.5 U	0.8 U	0.94 U	0.97 U	0.85 U	0.76 U	0.76 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.39 J	1.1	9.9	8.1	1.8	0.15 J	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	5	5.6	9.4	3.8	0.81	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	1.7	3.7	0.8	0.18 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.05 J	0.5 U	0.5 U
2-Hexanone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.2 J	5 U
Dibromochloromethane	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m,p-Xylenes	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.04	0.5 U	0.47 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	N/A	2 R	2 R	2 R	2 R	2 R	2 R	2 R	2 R	2 R

Notes:

SSGWSC = Site-specific groundwater screening criteria

All results in micrograms per liter (µg/L)

Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1

U = undetected

J = Result is estimated due to exceeded quality control criteria

R = Result is rejected

ft = feet below ground surface

LDL VOC = low detection limit volatile organic compounds

300947

Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-2 Port 1 450 to 455 ft GWM-02-1	Port 2 410 to 415 ft GWM-02-2	Port 3 370 to 375 ft GWM-02-3	Port 4 330 to 335 ft GWM-02-4	Port 5 290 to 295 ft GWM-02-5	Port 6 250 to 255 ft GWM-02-6	Port 7 190 to 195 ft GWM-02-7	Port 8 150 to 155 ft GWM-02-8	Port 9 100 to 105 ft GWM-02-9	Port 10 50 to 55 ft GWM-02-10
Tetrachloroethene	**5**	**1.8**	**2.3**	**4.4**	**2.6**	**2.2**	**4.3**	**2.3**	**2.3**	**0.38 J**	**0.14 J**
Trichloroethene	**5**	**15**	**17**	**38 J**	**21**	**23 J**	**17**	**12**	**18**	**18**	**1**
1,1-Dichloroethene	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**0.74**	**4.1**	**10**	**5.8**	**5.7**	**10**	**0.34 J**	**0.48 J**	**0.76**	**0.14 J**
Carbon Tetrachloride	**5**	**0.03 J**	**0.5 U**	**0.5 U**	**0.06 J**	**0.07 J**	**0.13 J**	**0.1 J**	**0.06 J**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	3	8.2	0.5 U	0.39 J	0.44 J	0.5 U	0.5 U	0.5 U	0.1 J	0.1 J
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Acetate	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	0.89 U	0.88 U	1.3 U	0.73 U	1.6 U	0.93	0.61 U	0.62 U	1.9 U	4.1
trans-1,2-Dichloroethene	5	0.5 U	0.22 J	0.58	0.35 J	0.24 J	0.84	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.97	0.54	1.1	0.58	0.67	1.1	0.72	1.4	4.6	0.5 U
1,1-Dichloroethane	5	0.5 U	0.87	0.38 J	0.19 J	0.17 J	0.33 J	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	60	68	5 U	5 U	5 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.27 J	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.15 J	0.5 U	0.5 U	0.07 J	0.5 U
1,2-Dichloroethane	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone	50	5 U	5 U	5 U	3.2 J	5 U	5 U	5 U	5 U	5 U	2.8 J
Dibromochloromethane	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m,p-Xylenes	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.04	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	N/A	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 R

Notes:

SSGWSC = Site-specific groundwater screening criteria

All results in micrograms per liter (µg/L)

Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1

U = undetected

J = Result is estimated due to exceeded quality control criteria

R = Result is rejected

ft = feet below ground surface

LDL VOC = low detection limit volatile organic compounds

300948

Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name		GWM-3													
		Port 1		Port 2		Port 3		Port 4		Port 5		Port 6		Port 7	
		450 to 455 ft		390 to 395 ft		370 to 375 ft		290 to 295 ft		170 to 175 ft		100 to 105 ft		50 to 55 ft	
LDL VOCs	SSGWSC	GWM-03-1		GWM-03-2		GWM-03-3		GWM-03-4		GWM-03-5		GWM-03-6		GWM-03-7	
Tetrachloroethene	**5**	**0.5**	**U**	**0.5**	**U**	**0.3**	**J**	**0.24**	**J**	**0.46**	**J**	**0.64**		**0.54**	
Trichloroethene	**5**	**6.1**		**14**		**13**		**0.51**		**1**		**0.5**	**U**	**0.5**	**U**
1,1-Dichloroethene	**5**	**0.5**	**U**	**1**		**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
cis-1,2-Dichloroethene	**5**	**0.12**	**J**	**0.8**		**0.61**		**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
Carbon Tetrachloride	**5**	**0.5**	**U**	**0.21**	**J**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.12**	**J**	**0.07**	**J**
Dichlorodifluoromethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichlorofluoromethane	5	52		15		9.2		0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acetone	50	3.1	J	5	U	5	U	5	U	5	U	4.2	J	5	U
Carbon Disulfide	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl Acetate	NA	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	0.54	U	1.4	U	1	U	1.3	U	1.4	U	0.5	U	0.5	U
trans-1,2-Dichloroethene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl tert-Butyl Ether	10	0.5	U	0.5	U	0.5	U	0.5	U	4.7		0.33	J	0.5	U
1,1-Dichloroethane	5	1.1		5.8		3.3		0.5	U	1.5		0.28	J	0.5	U
2-Butanone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chloroform	7	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-Trichloroethane	5	0.26	J	1.4		0.93		0.5	U	0.5	U	0.77		0.63	
Benzene	1	0.5	U	0.5	U	0.5	U	0.5	U	0.17	J	0.5	U	0.5	U
1,2-Dichloroethane	0.6	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	5	0.5	U	0.04	J	0.5	U	0.5	U	0.5	U	0.04	J	0.5	U
1,1,2-Trichloroethane	1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
2-Hexanone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dibromochloromethane	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Ethylbenzene	5	0.02	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
o-Xylene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
m,p-Xylenes	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromoform	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,3-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,4-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.05	J	0.5	U
1,2-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dibromo-3-chloropropane	0.04	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,4-Dioxane	N/A	2	R	2	R	2	R	2	R	2	R	2	R	2	R

Notes:

SSGWSC = Site-specific groundwater screening criteria

All results in micrograms per liter (μg/L)

Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1

U = undetected

J = Result is estimated due to exceeded quality control criteria

R = Result is rejected

ft = feet below ground surface

LDL VOC = low detection limit volatile organic compounds

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Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWM-4 Port 1 420 to 425 ft GWM-04-1	Port 2 400 to 405 ft GWM-04-2	Port 3 350 to 355 ft GWM-04-3	Port 4 305 to 310 ft GWM-04-4	Port 5 285 to 290 ft GWM-04-5	Port 6 245 to 250 ft GWM-04-6	Port 7 185 to 190 ft GWM-04-7	Port 8 145 to 150 ft GWM-04-8	Port 9 100 to 105 ft GWM-04-9	Port 10 45 to 50 ft GWM-04-10
Tetrachloroethene	**5**	**21 J**	**29**	**210**	**200**	**100**	**94**	**25**	**16**	**14**	**0.31 J**
Trichloroethene	**5**	**21 J**	**22**	**180**	**200**	**130**	**94**	**120**	**16**	**2.9**	**1.6**
1,1-Dichloroethene	**5**	**5.8**	**4**	**9.7**	**4.8**	**3.4**	**2**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**2.2 J**	**2.9**	**11 J**	**5**	**4.7**	**7.8**	**2.7**	**1.4**	**0.62**	**0.13 J**
Carbon Tetrachloride	**5**	**1.8**	**2.9**	**0.29 J**	**0.12 J**	**0.08 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.5 U	0.5 U	11 J	13	12	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	14	9.6	0.5 U	0.5 U	0.11 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Acetate	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	1.2	3	1.4	1.3	1.4	1.2 U	0.5 U	1.7 U	0.86 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 R	0.5 U	0.45 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	3	2.5	15	13	18	21	26 J	9.9	0.5 U	0.5 U
1,1-Dichloroethane	5	6	3.3	1.1	0.52	0.49 J	0.54	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	17	5 U	5 U	5 U	5 U
Chloroform	7	3.8	2.3	0.53	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	2.6	1.7	2.7	1.7	1.2	0.89	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.7	0.43 J	0.36 J	0.58	0.32 J	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.96	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.04 J	0.5 U	0.35 J	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	50	0.5 U	0.5 U	0.5 U	0.5 U	0.07 J	0.5 U	0.5 U	0.5 U	0.5 U	0.47 J
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.07 J	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.08 J	0.5 U	0.5 U	0.5 U	0.5 U
m,p-Xylenes	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.21 J	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.06 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.04	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	N/A	2 R	2 R	2 R	2 R	2 R	2 R	2 R	2 R	2 R	2 R

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (µg/L)
Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name		GWM-5									
		Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8	Port 9	Port 10
		430 to 435 ft	405 to 410 ft	355 to 360 ft	310 to 315 ft	290 to 295 ft	250 to 255 ft	190 to 195 ft	150 to 155 ft	95 to 100 ft	45 to 50 ft
LDL VOCs	SSGWSC	GWM-05-1	GWM-05-2	GWM-05-3	GWM-05-4	GWM-05-5	GWM-05-6	GWM-05-7	GWM-05-8	GWM-05-9	GWM-05-10
Tetrachloroethene	**5**	**0.35 J**	**0.92**	**0.63**	**0.73**	**0.6**	**0.72**	**0.4 J**	**0.49 J**	**0.11 J**	**0.37 J**
Trichloroethene	**5**	**9.3**	**28**	**14**	**18**	**18**	**12**	**2.1**	**1.7**	**0.19 J**	**1.6**
1,1-Dichloroethene	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**1.4**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**1.1**	**2.9**	**1.8**	**2**	**2**	**1.8**	**0.26 J**	**0.25 J**	**0.5 U**	**0.18 J**
Carbon Tetrachloride	**5**	**0.43 J**	**0.87**	**0.19 J**	**0.11 J**	**0.12 J**	**0.5 U**	**0.12 J**	**0.16 J**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	0.5 U	1.8	0.5 U	0.5 U	0.64	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.08 J	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Acetate	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.55 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.5 U	0.5 U	0.95	1.6	1.2	0.98	0.49 J	1.1	0.5 U	0.99
1,1-Dichloroethane	5	0.5 U	0.62	1.7	2.3	1.6	1.4	2.7	3.1	0.5 U	1
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	0.5 U	0.16 J	0.05 J	0.17 J	0.2 J	0.49 J	0.97	0.85	0.5 U	0.29 J
Benzene	1	0.5 U	0.5 U	0.13 J	0.03 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.06 J	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m,p-Xylenes	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.27 J	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.04	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	N/A	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (μg/L)
Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compounds

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Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

		GWM-6											
		Port 1		Port 2		Port 3		Port 4		Port 5		Port 6	
Chemical Name		445 to 450 ft		365 to 370 ft		245 to 250 ft		175 to 180 ft		100 to 105 ft		45 to 50 ft	
LDL VOCs	SSGWSC	GWM-06-1		GWM-06-2		GWM-06-3		GWM-06-4		GWM-06-5		GWM-06-6	
Tetrachloroethene	**5**	**0.5**	**U**	**0.5**	**U**	**0.29**	**J**	**0.24**	**J**	**0.54**		**0.087**	**J**
Trichloroethene	**5**	**1.4**		**0.5**	**U**	**2.3**		**1**		**2.5**		**0.5**	**U**
1,1-Dichloroethene	**5**	**0.5**	**U**	**0.5**	**U**	**9.7**		**6.7**		**16**		**0.5**	**U**
cis-1,2-Dichloroethene	**5**	**0.67**		**0.19**	**J**	**5.9**	**J**	**3.7**	**J**	**17**	**J**	**0.5**	**U**
Carbon Tetrachloride	**5**	**0.06**	**J**	**0.5**	**U**	**0.5**	**U**	**0.29**	**J**	**1**		**0.5**	**U**
Dichlorodifluoromethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichlorofluoromethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.22	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acetone	50	5	U	5	U	8.2		5	U	5	U	130	
Carbon Disulfide	50	0.5	U	0.47	J	0.36	J	0.37	J	0.5	U	0.37	J
Methyl Acetate	NA	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	6.7	
Methylene Chloride	5	1		0.5	U	0.5	U	0.5	U	1.5	U	0.5	U
trans-1,2-Dichloroethene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl tert-Butyl Ether	10	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethane	5	0.5	U	0.17	J	9.5		9.3		25	J	0.5	U
2-Butanone	50	5	U	5	U	2.1	J	5	U	5	U	22	
Chloroform	7	0.58	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-Trichloroethane	5	0.57		0.22	J	0.22	J	1.8		6.1		0.47	J
Benzene	1	0.5	U	0.5	U	0.5	U	0.063	J	0.5	U	0.5	U
1,2-Dichloroethane	0.6	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.4	0.5	U	0.5	U	0.17	J	0.5	U	0.5	U	0.5	U
Toluene	5	0.5	U	0.5	U	800		0.79		0.69		270	
1,1,2-Trichloroethane	1	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	U	0.5	U
2-Hexanone	50	5	U	5	U	5	U	5	U	5	U	5	U
Dibromochloromethane	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Ethylbenzene	5	0.5	U	0.5	U	0.23	J	0.089	J	0.5	U	0.42	J
o-Xylene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
m,p-Xylenes	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromoform	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,3-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.026	J
1,4-Dichlorobenzene	3	0.5	U	0.5	U	0.11	J	0.5	U	0.5	U	1.7	
1,2-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.042	J
1,2-Dibromo-3-chloropropane	0.04	0.5	U	0.5	U	0.5	UJ	0.5	U	0.5	U	0.5	U
1,4-Dioxane	N/A	2	U	2	U	2.4		2	U	6		2	U

Notes:

SSGWSC = Site-specific groundwater screening criteria

All results in micrograms per liter (µg/L)

Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1

U = undetected

J = Result is estimated due to exceeded quality control criteria

R = Result is rejected

ft = feet below ground surface

LDL VOC = low detection limit volatile organic compounds

300952

Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name		GWM-7					
		Port 1	Port 2	Port 3	Port 4	Port 5	Port 6
		445 to 450 ft	425 to 430 ft	310 to 315 ft	205 to 210 ft	100 to 105 ft	45 to 50 ft
LDL VOCs	SSGWSC	GWM-07-1	GWM-07-2	GWM-07-3	GWM-07-4	GWM-07-5	GWM-07-6
Tetrachloroethene	**5**	**0.5 U**	**0.5 U**	**7.7**	**0.56**	**0.69**	**0.5 U**
Trichloroethene	**5**	**0.24 J**	**6.2**	**20**	**0.81**	**1.8**	**0.5 U**
1,1-Dichloroethene	**5**	**0.5 U**	**5.2**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**0.5 U**	**0.76**	**3.9**	**0.5 U**	**0.5 U**	**0.5 U**
Carbon Tetrachloride	**5**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	2 J	5 U	5 U	5 U	5 U
Carbon Disulfide	50	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Acetate	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5	1.7 U	0.57	0.5 U	1.2 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.07 J	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	50	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	0.5 U	1.6	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.5 U	0.04 J	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone	50	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m,p-Xylenes	**5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.04	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	N/A	2 R	2 R	2 R	2 R	2 R	2 R

Notes:

SSGWSC = Site-specific groundwater screening criteria

All results in micrograms per liter (µg/L)

Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1

U = undetected

J = Result is estimated due to exceeded quality control criteria

R = Result is rejected

ft = feet below ground surface

LDL VOC = low detection limit volatile organic compounds

300953

Table 4-4
Multi-Port Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name	SSGWSC	GWM-8													
		Port 1		Port 2		Port 3		Port 4				Port 5		Port 6	
		435 to 440 ft		370 to 375 ft		235 to 240 ft		155 to 160 ft				100 to 105 ft		45 to 50 ft	
LDL VOCs		GWM-08-1		GWM-08-2		GWM-08-3		GWM-08-4		Duplicate		GWM-08-5		GWM-08-6	
Tetrachloroethene	**5**	**6.7**		**13**		**23**		**23**		**40**		**57**		**0.35**	**J**
Trichloroethene	**5**	**1.4**		**3.2**		**1.1**		**1.6**		**1**		**2**		**0.5**	**U**
1,1-Dichloroethene	**5**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
cis-1,2-Dichloroethene	**5**	**0.5**	**U**	**0.46**	**J**	**0.5**	**U**	**0.5**	**U**	**0.16**	**J**	**0.3**	**J**	**0.5**	**U**
Carbon Tetrachloride	**5**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
Dichlorodifluoromethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Trichlorofluoromethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Acetone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Carbon Disulfide	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl Acetate	NA	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methylene Chloride	5	0.5	U	0.5	U	0.5	U	0.63	U	0.5	U	0.5	U	0.5	U
trans-1,2-Dichloroethene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Methyl tert-Butyl Ether	10	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
2-Butanone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chloroform	7	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,1-Trichloroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Benzene	1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dichloroethane	0.6	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,3-Dichloropropene	0.4	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Toluene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
2-Hexanone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dibromochloromethane	50	0.5	U	0.5	U	0.5	U	0.5	U	0.16	J	0.5	U	0.5	U
Ethylbenzene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
o-Xylene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
m,p-Xylenes	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromoform	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,3-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,4-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dichlorobenzene	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dibromo-3-chloropropane	0.04	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,4-Dioxane	N/A	2	U	2	U	2	U	2	U	2	U	2	U	2	R

Notes:

SSGWSC = Site-specific groundwater screening criteria

All results in micrograms per liter (μg/L)

Data for SVP-1 Port 1 is not available because a sample was not able to be collected during Round 1

U = undetected

J = Result is estimated due to exceeded quality control criteria

R = Result is rejected

ft = feet below ground surface

LDL VOC = low detection limit volatile organic compounds

300954

Table 4-5
Existing Well and Supply Well VOC Results - March 2006 (Round 1)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name LDL VOCs	SSGWSC	GWP-10	GWP-11	GWP-11-Dup	GWX-10019	GWX-10020	GWX-10035	GWX-8474	GWX-8475	GWX-9398	GWX-9966	GWX-9953
		377-417 ft	370-410 ft		223 to 228 ft	185 to 190 ft	48 to 53 ft	485 to 556 ft	409 to 481 ft	21 to 22 ft	38 to 51 ft	35 to 40 ft
Tetrachloroethene	**5**	**270**	**50**	**50**	**2**	**1.3**	**0.5 U**	**5.8**	**5.5**	**0.16 J**	**0.5 U**	**0.5 U**
Trichloroethene	**5**	**170**	**160**	**160**	**260**	**1.6**	**1.2**	**29**	**24**	**0.5 U**	**0.5 U**	**0.5 U**
1,1-Dichloroethene	**5**	**5.5**	**4**	**4.2**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**17**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**13**	**13**	**14**	**21**	**0.19 J**	**0.5 U**	**0.76**	**1.2**	**0.5 U**	**0.5 U**	**0.5 U**
Carbon Tetrachloride	**5**	**0.85**	**0.42 J**	**0.43 J**	**0.2 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	9.4	20	21	0.62	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	2.4	1.5	1.6	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethar	5	0.5 U	0.28 J	0.3 J	0.5 U	0.5 U	0.5 U	0.48 J	2.3	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.3 J
Methylene Chloride	5	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	5	0.31 J	0.18 J	0.22 J	0.3 J	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.31 J	0.5 U	0.11 J	17	1.7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4.2
1,1-Dichloroethane	5	1.5	0.73	0.73	0.18 J	0.5 U	0.5 U	0.39 J	0.7	0.5 U	0.5 U	0.5 U
Chloroform	7	1.2	0.5 U	0.5 U	0.29 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	2.6	2.1	2.3	0.5 U	0.5 U	0.5 U	0.93	5.3	0.5 U	0.5 U	0.5 U
Benzene	1	0.25 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.6	0.5 U	0.5 U	0.5 U	1.3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.4	0.5 U	0.5 U	0.5 U	0.11 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.19 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (µg/L)
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compound

300955

Table 4-6
Existing Well Supply Well VOC Results - July 2006 (Round 2)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Chemical Name		GWP-10	GWP-11	GWP-11-Dup	GWX-10019	GWX-10020	GWX-10035	GWX-8086	GWX-8474	GWX-8475	GWX-9398	GWX-9966	GWX-9953
LDL VOCs	SSGWSC	377-417 ft	370-410 ft		223 to 228 ft	185 to 190 ft	48 to 53 ft	265-291 ft	485 to 556 ft	409 to 481 ft	21 to 22 ft	38 to 51 ft	35 to 40 ft
Tetrachloroethene	**5**	**230**	**58**	**48**	**2.2**	**0.5 U**	**0.5 U**	**170**	**6.3**	**3.7**	**0.5 U**	**0.5 U**	**0.5 U**
Trichloroethene	**5**	**220**	**160**	**120**	**170**	**0.14 J**	**0.31 J**	**54**	**25**	**16**	**0.5 U**	**0.5 U**	**0.5 U**
1,1-Dichloroethene	**5**	**12**	**3.7**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**	**17**	**7.4**	**20 J**	**0.5 U**	**0.5 U**	**0.5 U**
cis-1,2-Dichloroethene	**5**	**26 J**	**10**	**15**	**23**	**0.5 U**	**0.5 U**	**5.3 J**	**1.4 J**	**0.79 J**	**0.5 U**	**0.5 U**	**0.5 U**
Carbon Tetrachloride	**5**	**1.2**	**0.46 J**	**0.33 J**	**0.28 J**	**0.5 U**	**0.5 U**	**0.44 J**	**0.42 J**	**0.5 U**	**0.5 U**	**0.5 U**	**0.5 U**
Dichlorodifluoromethane	5	21	0.5 U	3.9 U	0.75 U	4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichlorofluoromethane	5	3.9	1.3	0.5 U	1.9	0.5 U	0.5 U	1.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5.5	1.2	4.9	0.5 U	0.5 U	0.5 U
Acetone	50	5 U	5 U	5 U	5 U	7.7 J	2.8 J	5 U	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	5	2.4 U	0.72 U	4.2 U	0.84 U	4.8 U	0.91 U	0.5 U	0.52 U	0.64 U	2.4	0.52 U	2.2
trans-1,2-Dichloroethene	5	0.64 J	0.06 J	0.2 J	0.24 J	0.5 U	0.5 U	0.07 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl tert-Butyl Ether	10	0.77	0.5 U	0.5 U	24	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5.3
1,1-Dichloroethane	5	2.5	0.74	0.98	0.22 J	0.5 U	0.5 U	1.2	0.48 J	0.75	0.5 U	0.5 U	0.5 U
Chloroform	7	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	5	4.8	2	2	0.5 U	0.5 U	0.5 U	4.1	2.7	6.9	0.5 U	0.5 U	0.5 U
Benzene	1	0.32 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.28 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.18 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	3 J	5 U	5 U	5 U	5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.03 J	0.5 U
o-Xylene	N/A	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 J	0.5 U
1,3-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.02 J	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.02 J	0.5 U	0.5 U	0.5 U

Notes:
SSGWSC = Site-specific groundwater screening criteria
All results in micrograms per liter (µg/L)
U = undetected
J = Result is estimated due to exceeded quality control criteria
R = Result is rejected
ft = feet below ground surface
LDL VOC = low detection limit volatile organic compound

300956

CDM

Table 4-7
Soil Gas Survey Screening Results
Old Roosevelt Field Contaminated Groundwater Area
Garden City, New York

SG Point ID	Date	Result (ppbv) 15 feet bgs Cal Check	15 feet bgs Reading	35 feet bgs Cal Check	35 feet bgs Reading	Notes
A0	12/13/2005	NA	106	NA	0	
A1			61		78	
A2			65		86	
A3			42		61	
A4	12/14/2005	NA	10	NA	7	
			19		4	Field Duplicate
A5			10		7	
A6			6		21	
A7			8		21	
A8			8		3	
A9	12/15/2005	NA	53	NA	245	
A10			68		233	
A11			136		148	
A12	12/16/2005	8	2	14	8	Instrument was recalibrated prior to reading 35' sample, recal = 9 ppbv
A13		8	0	9	17	
A14	12/19/2005	9	5	0	6	Instrument was recalibrated prior to reading 35' sample; recal = 9 ppbv
A15		10	1	0	NA	
A16		9	3	10	11	
A17	1/3/2006	8	0	9	17	
A18	1/3/2006	9	1	1	9	
A19	1/3/2006	9	0	8	0	
A20	1/3/2006	9	1	9	2	
B0	1/11//2006	8 to 10	2	8 to 10	4	
B1	1/16/2006	8 to 10	3	8 to 10	4	
B2	1/11//2006	8 to 10	0	8 to 10	0	
B3		8 to 10	0	7	0	Instrument was recalibrated prior to reading 35' sample; recal = 9 ppbv
		8 to 10	0	8 to 10	0	Field Duplicate
B4		8 to 10	0	8 to 10	0	
B5		8 to 10	0	8 to 10	0	
B6		8 to 10	0	8 to 10	0	Tracer Gas Test performed
B7		8 to 10	0	8 to 10	0	
B8		8 to 10	2	8 to 10	3	
B9	1/9/2006	8 to 10	10	8 to 10	0	
B10		8 to 10	0	8 to 10	0	Tracer Gas Test performed
B11		8 to 10	3	8 to 10	4	
B12		8 to 10	6	8 to 10	4	
B13		8 to 10	17	8 to 10	35	
B14	1/10/2006	NA	0	NA	0	
B15		NA	0	NA	368	Instrument was recalibrated prior to reading 35' sample; recal = 9 ppbv
B16		NA	0	NA	0	
B17		NA	45	NA	10	
B18		NA	0	NA	4	
		NA	0	NA	6	Field Duplicate
B19		NA	3	NA	19	Tracer Gas Test performed
B20	1/12/2006	8 to 10	0	8 to 10	0	
C0	1/19/2006	NA	0	NA	6	
C1		NA	0	NA	0	
C2	1/18/2006	8 to 10	0	8 to 10	0	
C3	1/16/2006	8 to 10	4	8 to 10	5	
C4		8 to 10	4	8 to 10	3	
C5	1/11//2006	8 to 10	2	8 to 10	3	
C6	1/16/2006	8 to 10	2	8 to 10	0	
C7	1/11//2006	8 to 10	0	8 to 10	0	
C8	1/16/2006	8 to 10	26	8 to 10	35	
C9		8 to 10	8	8 to 10	5	
C10	1/9/2006	8 to 10	1	8 to 10	0	
C11		8 to 10	0	8 to 10	0	
C12		8 to 10	0	8 to 10	62	Tracer Gas Test performed
C13	1/16/2006	8 to 10	4	8 to 10	3	
C14	1/12/2006	8 to 10	4	8 to 10	4	
C15	1/10/2006	8 to 10	0	8 to 10	0	
C16		8 to 10	8	8 to 10	11	
C17		8 to 10	16	8 to 10	3	
C18		8 to 10	10	8 to 10	7	
C19		8 to 10	9	8 to 10	9	
C20		8 to 10	2	8 to 10	37	
D0	1/19/2006	NA	22	NA	0	Tracer Gas Test performed
D1	1/18/2006	8 to 10	0	8 to 10	0	
D2		8 to 10	0	8 to 10	2	
D3		8 to 10	0	8 to 10	1	

Table 4-7
Soil Gas Survey Screening Results
Old Roosevelt Field Contaminated Groundwater Area
Garden City, New York

SG Point ID	Date	Result (ppbv) 15 feet bgs Cal Check	Reading	35 feet bgs Cal Check	Reading	Notes
D4	1/16/2006	8 to 10	4	8 to 10	4	Tracer Gas Test performed
D5	1/11/2006	8 to 10	8	8 to 10	8	
D6		8 to 10	0	8 to 10	0	
		8 to 10	0	8 to 10	0	Field Duplicate
D7	1/18/2006	8 to 10	0	8 to 10	1	
D12	1/16/2006	8 to 10	23	8 to 10	5	
D13	1/12/2006	8 to 10	4	8 to 10	20	Tracer Gas Test performed
D14	1/16/2006	8 to 10	4	8 to 10	4	
D15		8 to 10	3	8 to 10	4	
D17	1/19/2006	NA	531	NA	494	
D18		NA	2	NA	0	
D19		NA	534	NA	4	
D20		NA	0	NA	0	
E2	1/18/2006	8 to 10	10	8 to 10	5	
E3		8 to 10	2	8 to 10	1	
		8 to 10	2	8 to 10	0	Field Duplicate
E4	1/11/2006	8 to 10	1	8 to 10	3	
E5	1/18/2006	8 to 10	1	8 to 10	3	
E6	1/10/2006	8 to 10	5	8 to 10	5	Tracer Gas Test performed
E7		8 to 10	0	8 to 10	1	
E8	1/12/2006	8 to 10	0	8 to 10	10	
E9	1/16/2006	8 to 10	1	8 to 10	7	
E12		8 to 10	8	8 to 10	7	
E13		8 to 10	27	8 to 10	35	
E14		8 to 10	15	8 to 10	211	
E15	1/6/2006	8	34	8	44	
E17	1/4/2006	9	5	9	5	
E20		8	3	8	6	
F-1	1/19/2006	NA	1	NA	1	
F1	1/18/2006	8 to 10	5	8 to 10	5	
F2	1/18/2006	8 to 10	35	8 to 10	0	
		8 to 10	5	8 to 10	0	Field Duplicate
F3	1/17/2006	8 to 10	1	8 to 10	0	
F4	1/18/2006	8 to 10	1	8 to 10	4	
F5		8 to 10	0	8 to 10	0	
F6	1/10/2006	8 to 10	1	8 to 10	2	
F7	1/18/2006	8 to 10	0	8 to 10	2	
F8		8 to 10	4	8 to 10	0	
F9		8 to 10	0	8 to 10	0	
F10	1/13/2006	8 to 10	3	8 to 10	3	
F12	1/12/2006	8 to 10	1	8 to 10	1	
F13		8 to 10	0	8 to 10	0	
F14	1/16/2006	8 to 10	50	8 to 10	9	
F15	1/4/2006	9	2	9	3	Water table encountered at 32 feet; reading collected at 28 feet.
F17		8	3	8	14	Water table encountered at 33 feet; reading collected at 30 feet.
F20	1/19/2006	NA	163	NA	20	Tracer Gas Test performed
G-1		NA	9	NA	14	
G0		NA	0	NA	0	
G1	1/17/2006	8 to 10	0	8 to 10	1	
	1/17/2006	8 to 10	0	8 to 10	1	Field Duplicate
G2		8 to 10	0	8 to 10	7	
G3		8 to 10	1	8 to 10	4	
G5	1/10/2006	8 to 10	2	8 to 10	4	
G8	1/18/2006	8 to 10	0	8 to 10	0	
G9	1/10/2006	8 to 10	4	8 to 10	3	
G10	1/13/2006	8 to 10	6	8 to 10	4	
G11	1/19/2006	NA	0	NA	0	
G12	1/16/2006	8 to 10	16	8 to 10	5	
G13	1/12/2006	8 to 10	0	8 to 10	0	
G14		8 to 10	9	8 to 10	2	
G15	1/19/2006	NA	0	NA	0	
G20		NA	0	NA	1	
H-2		NA	1	NA	3	
H-1	1/13/2006	8 to 10	0	8 to 10	152	
H0	1/17/2006	8 to 10	0	8 to 10	2	
H1		8 to 10	1	8 to 10	1	
H2	1/17/2006	8 to 10	0	8 to 10	2	
H4	1/11/2006	8 to 10	0	8 to 10	3	
		8 to 10	0	8 to 10	1	Field Duplicate
H5		8 to 10	1	8 to 10	0	Tracer Gas Test performed
H8	1/10/2006	8 to 10	3	8 to 10	3	

Table 4-7
Soil Gas Survey Screening Results
Old Roosevelt Field Contaminated Groundwater Area
Garden City, New York

SG Point ID	Date	Result (ppbv) 15 feet bgs Cal Check	Result (ppbv) 15 feet bgs Reading	Result (ppbv) 35 feet bgs Cal Check	Result (ppbv) 35 feet bgs Reading	Notes
H11	1/13/2006	8 to 10	**0**	8 to 10	**3**	
H12		8 to 10	**7**	8 to 10	**2**	
H13		8 to 10	**0**	8 to 10	**5**	
H14		8 to 10	**1**	8 to 10	**0**	
H15		8 to 10	**0**	8 to 10	**0**	
H16		8 to 10	**0**	8 to 10	**0**	
H17		8 to 10	**3**	8 to 10	**2**	
H19	1/19/2006	NA	**75**	NA	**76**	Tracer Gas Test performed
H20		NA	**0**	NA	**0**	
I-2	1/11//2006	8 to 10	**1**	8 to 10	**2**	
I-1		8 to 10	**3**	8 to 10	**7**	
		8 to 10	**2**	8 to 10	**8**	Field Duplicate
I1	1/13/2006	8 to 10	**0**	8 to 10	**0**	
I2	1/19/2006	NA	**0**	NA	**11**	
J-2	1/11/2006	8 to 10	**2**	8 to 10	**2**	
J-1		8 to 10	**1**	8 to 10	**4**	
J0		8 to 10	**1**	8 to 10	**1**	
J1	1/19/2006	NA	**0**	NA	**0**	
K-1	1/13/2006	8 to 10	**0**	8 to 10	**2**	
K0	1/13/2006	8 to 10	**3**	8 to 10	**185**	
K1	1/11//2006	8 to 10	**2**	8 to 10	**3**	
L0	1/13/2006	8 to 10	**4**	8 to 10	**3**	
L1		8 to 10	**2**	8 to 10	**1**	Tracer Gas Test performed
M0		8 to 10	**75**	8 to 10	**0**	
SGRF1	12/20/2005	9	**1**	9	**NA**	
SGRF2		9	**0**	9	**NA**	
SGRF3		10	**1**	10	**NA**	Tracer Gas Test performed
SGRF4	12/21/2005	9	**1**	9	**NA**	
SGRF5		0	**1**	0	**NA**	
SGRF6		9	**0**	9	**NA**	
SGTB-1		NA	**NA**	NA	**NA**	
SGRF7	12/22/2005	9	**1**	9	**NA**	
SGRF8		9	**1**	9	**NA**	
SGRF9		9	**1**	9	**NA**	Field Duplicate
SGRF10		9	**2**	9	**NA**	
SGRF11		9	**1**	9	**NA**	
SGRF12	12/23/2005	9	**1**	9	**NA**	
SGRF13		9	**1**	9	**NA**	
SGRF14		9	**0**	9	**NA**	
SGRF15		9	**1**	9	**NA**	
SGRF16	1/5/2006	9	**2**	9	**NA**	Tracer Gas Test performed
SGRF17		8	**3**	8	**NA**	
SGRF18		9	**4**	9	**NA**	
SGRF19		9	**2**	9	**NA**	
SGRF20		9	**2**	9	**NA**	
SGRF21		9	**4**	9	**NA**	
SGRF22		8	**3**	8	**NA**	
SGRF23		9	**1**	9	**NA**	
SGRF24	1/6/2006	9	**0**	9	**NA**	
SGRF25		9	**3**	9	**NA**	
SGRF26		9	**0**	9	**NA**	Tracer Gas Test performed
SGRF27		9	**451**	9	**NA**	Instrument recalibrated twice
SGRF28		8	**1**	8	**NA**	Instrument recalibrated twice
SGRF29		9	**3**	9	**NA**	
SGRF30		8	**151**	8	**NA**	
SGRF31		8	**0**	8	**NA**	
SGRF32		8	**62**	8	**NA**	
SGRF33		8	**0**	8	**NA**	Water table encountered at 15 feet; reading collected at 14 feet
SGRF34		8	**0**	8	**NA**	Field Duplicate
SGHP1	12/22/2005	NA	**NA**	NA	**NA**	
SGHP2		NA	**NA**	NA	**NA**	There was no screening performed a this location
SGHP3		NA	**NA**	NA	**NA**	
SGHP4		NA	**NA**	NA	**NA**	There was no screening performed a this location

Notes:
cal = calibration
bgs = below ground surface
ppbv = parts per billion per volume
NA = Not Applicable
The (-) symbol desginates an additional screening point in the associated row of the grid
The "A" grid line is located north/south along Clinton Road, with SG Point ID A0 located on the corner of Clinton Road and Old Country Road.
H18 was not collected

Table 4-8
TO-15 VOC Results - Outdoor Building Soil Gas Samples
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Contaminant	Screening Criteria (1)	SGRF-01 12/20/2005	SGRF-02 12/20/2005	SGRF-03 12/20/2005	SGRF-04 12/21/2005	SGRF-05 12/21/2005	SGRF-06 12/21/2005	SGRF-07 12/22/2005	SGRF-08 12/22/2005	SGRF-08-Dup 12/22/2005	SGRF-12 12/23/2005
Tetrachloroethene	**81**	**6.6 U**	**6.8 U**	**6.5 U**	**6.5 U**	**6.4 U**	**6.5 U**	**6.6 U**	**7.1 U**	**7.3 U**	**6.7 U**
Trichloroethene	**2.2**	**5.2 U**	**5.4 U**	**5.2 U**	**5.2 U**	**5.1 U**	**5.2 U**	**5.2 U**	**5.6 U**	**5.8 U**	**5.3 U**
1,1-Dichloroethene	**20,000**	**3.8 U**	**4 U**	**3.8 U**	**3.8 U**	**3.7 U**	**3.8 U**	**3.8 U**	**4.1 U**	**4.3 U**	**3.9 U**
cis-1,2-Dichloroethene	**3,500**	**3.8 U**	**4 U**	**3.8 U**	**3.8 U**	**3.7 U**	**3.8 U**	**3.8 U**	**4.1 U**	**4.3 U**	**3.9 U**
Carbon Tetrachloride	**18**	**6.1 U**	**6.4 U**	**6 U**	**6 U**	**5.9 U**	**6 U**	**6.1 U**	**6.6 U**	**6.8 U**	**6.2 U**
Dichlorodifluoromethane	20,000	4.8 U	5 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	5.2 U	5.3 U	4.9 U
Chloromethane	NA	8 U	8.3 U	7.9 U	7.9 U	7.8 U	7.9 U	8 U	8.6 U	8.9 U	8.1 U
1,3-Butadiene	0.87	2.1 U	2.2 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.3 U	2.4 U	2.2 U
Trichlorofluoromethane	70,000	1.4 J	5.7 U	5.4 U	1.3 J	1.7 J	5.4 U	5.4 U	5.9 U	6.1 U	5.5 U
Ethanol	NA	7.3 U	6.1 J	12	8.1	9.4	7.7	9.1	12	9.6	6.9 J
1,1,2-Trichloro-1,2,2-trifluoroethane	3,000,000	7.4 U	7.7 U	7.4 U	7.4 U	7.2 U	7.4 U	7.4 U	8 U	8.3 U	7.5 U
Acetone	35,000	9 J	7.1 J	30	28	13	18	15	22	10	8.4 J
Isopropyl Alcohol	NA	9.5 U	1.1 J	3.4 J	9.4 U	9.3 U	9.4 U	9.5 U	10 U	11 U	9.7 U
Carbon Disulfide	70,000	3 U	3.1 U	4.4	3 U	0.98 J	1.4 J	0.92 J	0.94 J	3.4 U	3.1 U
Methylene Chloride	520	3.4 U	3.5 U	3.3 U	3.3 U	3.3 U	0.99 J	3.4 U	3.6 U	3.8 U	3.4 U
Methyl tert-Butyl Ether	300,000	3.5 U	3.6 U	3.5 U	3.5 U	3.4 U	3.5 U	3.5 U	3.8 U	3.9 U	3.6 U
Hexane	20,000	3.4 U	1.2 J	8.6	2 J	1.4 J	1.1 J	2.8 J	2 J	1.9 J	3.5 U
1,1-Dichloroethane	50,000	3.9 U	4.1 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	4.2 U	4.4 U	4 U
2-Butanone	NA	2.9 U	3 U	5.1	1.2 J	1.1 J	0.95 J	1.3 J	2.5 J	3.2 U	1.2 J
Tetrahydrofuran	NA	3.4	2.1 J	2.7 J	1.9 J	1.9 J	2.8 U	2.9 U	3.1 U	3.2 U	2.9 U
Chloroform	11	4.7 U	4.9 U	4.7 U	4.7 U	4.6 U	4.7 U	4.7 U	5.1 U	5.3 U	4.8 U
1,1,1-Trichloroethane	220,000	5.3 U	5.5 U	5.2 U	5.2 U	5.2 U	5.2 U	5.3 U	5.7 U	5.9 U	5.4 U
Cyclohexane	NA	3.3 U	3.5 U	3.3 U	3.3 U	3.2 U	3.3 U	3.3 U	3.6 U	3.7 U	3.4 U
2,2,4-Trimethylpentane	NA	4.5 U	4.7 U	4.5 U	4.5 U	4.4 U	4.5 U	4.5 U	4.9 U	5 U	4.6 U
Benzene	31	1.6 J	1.5 J	3.5	2.9 J	1.6 J	1.6 J	1.6 J	2.2 J	1.8 J	1.8 J
1,2-Dichloroethane	9.4	3.9 U	4.1 U	3.9 U	3.9 U	3.8 U	3.9 U	3.9 U	4.2 U	4.4 U	4 U
n-Heptane	NA	4 U	4.1 U	5.1	3.9 U	3.9 U	3.9 U	4 U	4.3 U	4.4 U	4 U
1,4-Dioxane	NA	14 U	14 U	14 U	14 U	14 U	14 U	14 U	15 U	16 U	14 U
Toluene	40,000	3 J	2.9 J	3.6	3.6	2.7 J	3.2 J	3.2 J	4.5	3.9 J	2.2 J
2-Hexanone	NA	16 U	16 U	16 U	16 U	15 U	16 U	16 U	17 U	18 U	16 U
Ethylbenzene	220	4.2 U	4.4 U	4.2 U	4.2 U	4.1 U	4.2 U	4.2 U	4.5 U	4.7 U	4.3 U
m-Xylene	700,000	4.2 U	4.4 U	3.6 J	1.7 J	1.7 J	1.7 J	1.9 J	2.8 J	2.3 J	4.3 U
o-Xylene	700,000	4.2 U	4.4 U	2.1 J	4.2 U	4.1 U	4.2 U	4.2 U	4.5 U	4.7 U	4.3 U
n-Propylbenzene	14,000	4.8 U	5 U	0.95 J	4.7 U	4.6 U	4.7 U	4.8 U	5.1 U	5.3 U	4.8 U
4-Ethyltoluene	NA	4.8 U	5 U	3.2 J	4.7 U	4.6 U	4.7 U	4.8 U	5.1 U	5.3 U	4.8 U
1,3,5-Trimethylbenzene	600	4.8 U	5 U	1 J	4.7 U	4.6 U	4.7 U	4.8 U	5.1 U	5.3 U	4.8 U
1,2,4-Trimethylbenzene	600	4.8 U	5 U	3.6 J	4.7 U	4.6 U	4.7 U	4.8 U	5.1 U	5.3 U	4.8 U

Notes:
All values are in micrograms per cubic meter (µg/m3)
(1) EPA Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002 Table 2C, deep soil gas
SGRF-10 and SGRF-11 were not collected due to underground utilities
NA = not available
U = non-detect
J = estimated value
R = rejected

300960

Table 4-8
TO-15 VOC Results - Outdoor Building Soil Gas Samples
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Contaminant	Screening Criteria (1)	SGRF-13 12/23/2005		SGRF-14 12/23/2005		SGRF-15 12/23/2005		SGRF-16 1/5/2006		SGRF-17 1/5/2006		SGRF-18 1/5/2006		SGRF-19 1/5/2006		SGRF-20 1/5/2006		SGRF-21 1/5/2006		SGRF-22 1/5/2006	
Tetrachloroethene	**81**	**6.7**	**U**	**6.8**	**U**	**7**	**U**	**7.3**	**U**	**2.3**	**J**	**6.7**	**U**	**7.1**	**U**	**7.1**	**U**	**7.2**	**U**	**6.8**	**U**
Trichloroethene	**2.2**	**5.3**	**U**	**5.4**	**U**	**5.5**	**U**	**5.8**	**U**	**1.5**	**J**	**5.3**	**U**	**5.6**	**U**	**5.6**	**U**	**5.7**	**U**	**5.4**	**U**
1,1-Dichloroethene	**20,000**	**3.9**	**U**	**4**	**U**	**4.1**	**U**	**4.3**	**U**	**3.9**	**U**	**3.9**	**U**	**4.2**	**U**	**4.1**	**U**	**4.2**	**U**	**4**	**U**
cis-1,2-Dichloroethene	**3,500**	**3.9**	**U**	**4**	**U**	**4.1**	**U**	**4.3**	**U**	**3.9**	**U**	**3.9**	**U**	**4.2**	**U**	**4.1**	**U**	**4.2**	**U**	**4**	**U**
Carbon Tetrachloride	**18**	**6.3**	**U**	**6.4**	**U**	**6.4**	**U**	**6.8**	**U**	**6.2**	**U**	**6.2**	**U**	**6.6**	**UJ**	**6.6**	**UJ**	**6.7**	**UJ**	**6.4**	**UJ**
Dichlorodifluoromethane	20,000	4.9	U	5	U	5.1	U	2.5	J	2.8	J	2.8	J	5.2	U	2.8	J	2.8	J	2.8	J
Chloromethane	NA	8.2	U	8.3	U	8.5	U	8.9	U	2.5	J	3.6	J	2.4	J	1.9	J	1.7	J	2.2	J
1,3-Butadiene	0.87	2.2	U	2.2	U	2.3	U	2.4	U	4		2.2	U	3.3	J	9.9	J	7.2	J	2.4	J
Trichlorofluoromethane	70,000	5.6	U	5.7	U	5.8	U	6.1	U	5.5	U	5.5	U	5.9	U	5.9	U	6	U	5.7	U
Ethanol	NA	8.8		13		18		4.1	J	8.4	J	6.1	J	10		15		11		14	
1,1,2-Trichloro-1,2,2-trifluoroethane	3,000,000	7.6	U	7.7	U	7.8	U	8.3	U	7.5	U	7.5	U	8	U	8	U	8.2	U	7.7	U
Acetone	35,000	7.8	J	6.9	J	35		10	U	16	U	9.4	U	15		18		12		18	
Isopropyl Alcohol	NA	9.8	U	9.9	U	2.7	J	11	U	1.4	J	65		1.5	J	2.6	J	3.5	J	2.3	J
Carbon Disulfide	70,000	3.1	U	3.1	U	3.2	U	0.47	J	19		3.1	U	0.8	J	2.8	J	1.9	J	0.72	J
Methylene Chloride	520	1.3	J	3.5	U	1.1	J	3.8	U	1.3	J	3.4	U	3.6	U	3.6	U	3.7	U	3.5	U
Methyl tert-Butyl Ether	300,000	3.6	U	3.6	U	0.97	J	3.9	UJ	3.6	UJ	3.6	UJ	3.8	U	0.95	J	1.3	J	1.4	J
Hexane	20,000	1.3	J	1.4	J	2.1	J	3.8	U	3.1	J	3.5	U	3.5	J	5		4.1		1.5	J
1,1-Dichloroethane	50,000	4	U	4.1	U	4.1	U	4.4	U	4	U	4	U	4.2	U	4.2	U	4.3	U	4.1	U
2-Butanone	NA	1.6	J	1	J	7.5		0.96	J	3.1		1.4	J	3.1		4.2		3	J	3	J
Tetrahydrofuran	NA	1.8	J	3	U	2	J	3.2	U	2.9	U	2.9	U	3.1	U	3.1	U	3.1	U	3	U
Chloroform	11	4.8	U	4.9	U	5	U	5.3	U	4.8	U	4.8	U	5.1	U	5.1	U	5.2	U	4.9	U
1,1,1-Trichloroethane	220,000	5.4	U	5.5	U	5.6	U	5.9	U	5.4	U	5.4	U	5.7	U	5.7	U	5.8	U	5.5	U
Cyclohexane	NA	3.4	U	3.5	U	3.5	U	3.7	U	3.4	U	3.4	U	3.6	U	3.6	U	3.7	U	3.5	U
2,2,4-Trimethylpentane	NA	4.6	U	4.7	U	0.96	J	5	UJ	4.6	UJ	4.6	UJ	4.9	U	4.9	U	5	U	4.7	U
Benzene	31	2.3	J	2.8	J	2.8	J	2.2	J	3.8		1.5	J	2.6	J	4.2		3.4		2	J
1,2-Dichloroethane	9.4	4	U	4.1	U	4.1	U	4.4	U	4	U	4	U	4.2	U	4.2	U	2.4	J	4.1	U
n-Heptane	NA	4.1	U	4.1	U	4.2	U	4.4	U	3	J	4	U	4.3	U	3.4	J	4.4	U	4.1	U
1,4-Dioxane	NA	14	U	14	U	15	U	16	U	14	U	2.4	J	15	U	15	U	19		14	U
Toluene	40,000	3.1	J	3.9		4.6		2.2	J	5.7		3.7	J	3.9	J	6		8.3		4.7	
2-Hexanone	NA	16	U	16	U	1.3	J	18	U	16	U	16	U	17	U	17	U	17	U	16	U
Ethylbenzene	220	4.3	U	4.4	U	4.4	U	4.7	U	4.3	U	4.3	U	4.6	U	4.5	U	4.6	U	4.4	U
m-Xylene	700,000	3.1	J	2.1	J	2.6	J	4.7	U	4.3	U	2.2	J	4.6	U	2.4	J	4.2	J	3.6	J
o-Xylene	700,000	1.3	J	4.4	U	4.4	U	4.7	U	4.3	U	4.3	U	4.6	U	4.5	U	1.5	J	1.5	J
n-Propylbenzene	14,000	4.9	U	5	U	5	U	5.3	U	4.8	U	4.8	U	5.2	U	5.1	U	5.2	U	5	U
4-Ethyltoluene	NA	2.2	J	5	U	5	U	5.3	U	4.8	U	5.2		5.2	U	5.1	U	5.2	U	1.7	J
1,3,5-Trimethylbenzene	600	4.9	U	5	U	5	U	5.3	U	4.8	U	18		5.2	U	5.1	U	5.2	U	5	U
1,2,4-Trimethylbenzene	600	2.9	J	5	U	5	U	5.3	U	4.8	U	4.7	J	5.2	U	5.1	U	5.2	U	2	J

Notes:
All values are in micrograms per cubic meter (µg/m3)
(1) EPA Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002 Table 2C, deep soil gas
SGRF-10 and SGRF-11 were not collected due to underground utilities
NA = not available
U = non-detect
J = estimated value
R = rejected

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Table 4-8
TO-15 VOC Results - Outdoor Building Soil Gas Samples
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Contaminant	Screening Criteria (1)	SGRF-23 1/5/2006	SGRF-24 1/6/2006	SGRF-25 1/6/2006	SGRF-26 1/6/2006	SGRF-27 1/6/2006	SGRF-28 1/6/2006	SGRF-29 1/6/2006	SGRF-30 1/6/2006	SGRF-31 1/6/2006	SGRF-32 1/6/2006
Tetrachloroethene	**81**	**6.8 U**	**7.2 U**	**6.7 U**	**7.3 U**	**6.7 U**	**6.7 U**	**6.8 U**	**6.8 U**	**6.7 U**	**6.8 U**
Trichloroethene	**2.2**	**5.4 U**	**5.7 U**	**23**	**5.8 U**	**5.3 U**	**5.3 U**	**5.4 U**	**5.4 U**	**5.3 U**	**5.4 U**
1,1-Dichloroethene	**20,000**	**4 U**	**4.2 U**	**3.9 U**	**4.3 U**	**3.9 U**	**3.9 U**	**4 U**	**4 U**	**3.9 U**	**4 U**
cis-1,2-Dichloroethene	**3,500**	**4 U**	**4.2 U**	**3.9 U**	**4.3 U**	**3.9 U**	**3.9 U**	**4 U**	**4 U**	**3.9 U**	**4 U**
Carbon Tetrachloride	**18**	**6.4 UJ**	**6.7 U**	**6.3 U**	**6.8 U**	**6.3 U**	**6.3 U**	**6.4 U**	**6.4 U**	**6.3 U**	**6.4 U**
Dichlorodifluoromethane	20,000	2.8 J	5.3 U	4.9 U	5.3 U	4.9 U	4.9 U	5 U	5 U	4.9 U	5 U
Chloromethane	NA	3.2 J	8.8 U	8.2 U	8.9 U	8.2 U	8.2 U	8.3 U	8.3 U	8.2 U	8.3 U
1,3-Butadiene	0.87	2.2 U	2.4 UJ	2.2 UJ	2.4 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ
Trichlorofluoromethane	70,000	5.7 U	6 U	5.6 U	6.1 U	1.4 J	1.3 J	5.7 U	1.3 J	5.6 U	5.7 U
Ethanol	NA	8.1	5.8 J	7 J	8.2	4.5 J	16	6.6 J	7.2 J	70	3.8 J
1,1,2-Trichloro-1,2,2-trifluoroethane	3,000,000	7.7 U	8.2 U	7.6 U	8.3 U	7.6 U	7.6 U	7.7 U	7.7 U	7.6 U	7.7 U
Acetone	35,000	13	7.9 J	6.8 J	6.7 J	7.1 J	17	9 J	3.9 J	7.6 J	14
Isopropyl Alcohol	NA	1.6 J	1.4 J	0.7 J	0.79 J	0.82 J	1.4 J	1.1 J	1.7 J	2.4 J	1.6 J
Carbon Disulfide	70,000	0.6 J	3.3 U	2.2 J	3.4 U	3.1 U	1.3 J	3.1 U	3.1 U	0.98 J	3.1 U
Methylene Chloride	520	2 J	3.7 U	0.84 J	3.8 U	3.4 U	3.4 U	1 J	1.6 J	3.4 U	3.5 U
Methyl tert-Butyl Ether	300,000	3.6 U	3.8 U	3.6 U	3.9 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Hexane	20,000	3.6 U	3.8 U	1.5 J	3.8 U	3.5 U	1.6 J	3.6 U	1.3 J	3.5 U	1.8 J
1,1-Dichloroethane	50,000	4.1 U	4.3 U	4 U	4.4 U	4 U	4 U	4.1 U	4.1 U	4 U	4.1 U
2-Butanone	NA	2.5 J	2 J	2 J	1.8 J	1.6 J	3.5	2 J	3 U	1.7 J	2.8 J
Tetrahydrofuran	NA	3 U	2.2 J	2.9 U	3.2 U	2.9 U	2.9 U	2.6 J	3.6	2.9 U	2.1 J
Chloroform	11	4.9 U	5.2 U	4.8 U	5.3 U	4.8 U	4.8 U	4.9 U	4.9 U	4.8 U	4.9 U
1,1,1-Trichloroethane	220,000	5.5 U	5.8 U	5.4 U	5.9 U	5.4 U	5.4 U	5.5 U	5.5 U	5.4 U	5.5 U
Cyclohexane	NA	3.5 U	3.7 U	3.4 U	3.7 U	3.4 U	3.4 U	3.5 U	3.5 U	3.4 U	3.5 U
2,2,4-Trimethylpentane	NA	4.7 U	5 U	4.6 U	5 U	4.6 U	4.6 U	4.7 U	4.7 U	4.6 U	4.7 U
Benzene	31	1.5 J	1.3 J	2.2 J	1.4 J	1.3 J	1.7 J	1.4 J	1.3 J	1.4 J	3 J
1,2-Dichloroethane	9.4	4.1 U	4.3 U	4 U	4.4 U	4 U	4 U	4.1 U	4.1 U	4 U	4.1 U
n-Heptane	NA	4.1 U	4.4 U	4.1 U	4.4 U	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U
1,4-Dioxane	NA	14 U	15 U	14 U	16 U	14 U	14 U	14 U	14 U	14 U	14 U
Toluene	40,000	3.6 J	1.9 J	2.6 J	2.4 J	2.2 J	2.3 J	1.8 J	3.1 J	1.4 J	2.6 J
2-Hexanone	NA	16 U	17 U	16 U	18 U	16 U	16 U	16 U	16 U	16 U	16 U
Ethylbenzene	220	4.4 U	4.6 U	4.3 U	4.7 U	4.3 U	4.3 U	4.4 U	4.4 U	4.3 U	4.4 U
m-Xylene	700,000	4.4 U	4.6 U	4.3 U	4.7 U	4.3 U	4.3 U	4.4 U	4.4 U	4.3 U	4.4 U
o-Xylene	700,000	4.4 U	4.6 U	4.3 U	4.7 U	4.3 U	4.3 U	4.4 U	4.4 U	4.3 U	4.4 U
n-Propylbenzene	14,000	5 U	5.2 U	4.9 U	5.3 U	4.9 U	4.9 U	5 U	5 U	4.9 U	5 U
4-Ethyltoluene	NA	5 U	5.2 U	4.9 U	5.3 U	1.5 J	4.9 U	5 U	5 U	4.9 U	1.7 J
1,3,5-Trimethylbenzene	600	5 U	5.2 U	4.9 U	5.3 U	4.9 U	4.9 U	5 U	5 U	4.9 U	5 U
1,2,4-Trimethylbenzene	600	5 U	5.2 U	4.9 U	5.3 U	1.6 J	4.9 U	5 U	5 U	4.9 U	2.2 J

Notes:

All values are in micrograms per cubic meter (µg/m3)

(1) EPA Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002 Table 2C, deep soil gas

SGRF-10 and SGRF-11 were not collected due to underground utilities

NA = not available

U = non-detect

J = estimated value

R = rejected

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Table 4-8
TO-15 VOC Results - Outdoor Building Soil Gas Samples
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

Contaminant	Screening Criteria (1)	SGRF-33 1/6/2006	SGRF-33-Dup 1/6/2006	SGHP1 1/12/2006	SGHP1 12/22/2005	SGHP2 1/12/2006	SGHP3 1/12/2006	SGHP3 12/22/2005	SGHP4 1/12/2006
Tetrachloroethene	**81**	**6.8 U**	**6.7 U**	**11**	**6.7 U**	**17**	**23**	**6.8 U**	**14**
Trichloroethene	**2.2**	**5.4 U**	**5.3 U**	**5.7 U**	**5.3 U**	**3.9 J**	**12**	**5.4 U**	**3 J**
1,1-Dichloroethene	**20,000**	**4 U**	**3.9 U**	**4.2 U**	**3.9 U**	**3.9 U**	**3.9 U**	**4 U**	**3.9 U**
cis-1,2-Dichloroethene	**3,500**	**4 U**	**3.9 U**	**4.2 U**	**3.9 U**	**2.5 J**	**6.5**	**4 U**	**3.9 U**
Carbon Tetrachloride	**18**	**6.4 U**	**6.2 U**	**6.7 U**	**6.3 U**	**6.3 U**	**6.3 U**	**6.4 U**	**6.3 U**
Dichlorodifluoromethane	20,000	5 U	4.9 U	2.4 J	4.9 U	2.2 J	2.3 J	5 U	2.9 J
Chloromethane	NA	8.3 U	8.1 U	1.9 J	8.2 U	8.2 U	3.3 J	8.3 U	2.4 J
1,3-Butadiene	0.87	2.2 UJ	2.2 UJ	2.4 U	2.2 U	2.2 U	2.2 U	2.2 U	3.9 J
Trichlorofluoromethane	70,000	5.7 U	5.5 U	6 U	5.6 U	5.6 U	1.7 J	5.7 U	5.6 U
Ethanol	NA	3 J	6.7 J	11	7.7	8.5	13	22	10
1,1,2-Trichloro-1,2,2-trifluoroethane	3,000,000	7.7 U	7.5 U	8.2 U	7.6 U	7.6 U	4.3 J	7.7 U	7.6 U
Acetone	35,000	5.5 J	2.7 J	36	22	20	19	20	20
Isopropyl Alcohol	NA	0.81 J	0.82 J	1.9 J	9.8 U	1.5 J	2.8 J	4.7 J	1.4 J
Carbon Disulfide	70,000	3.1 U	1 J	3.3 U	1.4 J	3.1 U	3.1 U	2.1 J	2.9 J
Methylene Chloride	520	3.5 U	3.4 U	3.7 U	1.5 J	3.4 U	1.2 J	4.6	3.4 U
Methyl tert-Butyl Ether	300,000	3.6 U	3.6 U	3.8 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Hexane	20,000	3.6 U	3.5 U	1.2 J	3.5 U	0.88 J	1.4 J	4.3	1.6 J
1,1-Dichloroethane	50,000	4.1 U	4 U	4.3 U	4 U	4 U	6.8	4.1 U	4 U
2-Butanone	NA	0.91 J	0.96 J	3.7	5.4	2.7 J	2.5 J	3.2	3.6
Tetrahydrofuran	NA	3 U	2.9 U	3.1 U	2.9 U	2.9 U	2.9 U	3 U	2.9 U
Chloroform	11	4.9 U	4.8 U	5.2 U	4.8 U	4.8 U	7.9	4.9 U	4.8 U
1,1,1-Trichloroethane	220,000	5.5 U	5.4 U	5.8 U	5.4 U	5.4 U	21	5.5 U	5.4 U
Cyclohexane	NA	3.5 U	3.4 U	3.7 U	3.4 U	3.4 U	3.4 U	1.7 J	3.4 U
2,2,4-Trimethylpentane	NA	4.7 U	4.6 U	5 UJ	4.6 U	4.6 UJ	4.6 UJ	1.2 J	4.6 UJ
Benzene	31	1.2 J	0.86 J	1.7 J	1.4 J	1.7 J	2 J	3 J	2.6 J
1,2-Dichloroethane	9.4	4.1 U	4 U	4.3 U	4 U	4 U	4 U	4.1 U	4 U
n-Heptane	NA	4.1 U	4 U	4.4 U	4.1 U	4.1 U	4.1 U	4.4	4.1 U
1,4-Dioxane	NA	14 U	14 U	15 U	14 U	14 U	14 U	14 U	14 U
Toluene	40,000	1.4 J	1.3 J	3.2 J	2.5 J	2.8 J	3.2 J	17	3.7 J
2-Hexanone	NA	16 U	16 U	17 U	16 U	16 U	16 U	16 U	16 U
Ethylbenzene	220	4.4 U	4.3 U	4.6 U	4.3 U	4.3 U	4.3 U	2 J	4.3 U
m-Xylene	700,000	4.4 U	4.3 U	4.6 U	4.3 U	4.3 U	4.3 U	5.7	4.3 U
o-Xylene	700,000	4.4 U	4.3 U	4.6 U	4.3 U	4.3 U	4.3 U	2 J	4.3 U
n-Propylbenzene	14,000	5 U	4.8 U	5.2 U	4.9 U	4.9 U	4.9 U	5 U	4.9 U
4-Ethyltoluene	NA	5 U	4.8 U	5.2 U	4.9 U	4.9 U	4.9 U	5 U	4.9 U
1,3,5-Trimethylbenzene	600	5 U	4.8 U	5.2 U	4.9 U	4.9 U	4.9 U	5 U	4.9 U
1,2,4-Trimethylbenzene	600	5 U	4.8 U	5.2 U	4.9 U	4.9 U	4.9 U	1.7 J	4.9 U

Notes:

All values are in micrograms per cubic meter (μg/m3)
(1) EPA Draft Document for Evaluating the Vapor Intrusion to
Indoor Air Pathway from Groundwater and Soils, November 2002
Table 2C, deep soil gas
SGRF-10 and SGRF-11 were not collected due to underground utilities
NA = not available
U = non-detect
J = estimated value
R = rejected

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Table 5-1
Fate and Transport Properties for Site-Related VOCs
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CONTAMINANT	Molec. Weight (g/mole)	Water Solubility @25 deg. C (µg/l)	Vapor Pressure @25 deg. C (mm Hg)	Henry's Law Constant (atm-m^3/mol)	Koc (ml/g)	log Kow	Kd (cm^3/g)	Rf	Adsorption	Volatilization from Water	Mobility
TCL VOCs											
Tetrachloroethene	166	1.5E-01	1.8E+01	1.8E-02	3.6E+02	2.6	7.2E-02	1.8E+00	Low	High	High
Trichloroethene	131	1.1E+00	6.9E+01	9.1E-03	1.3E+02	2.4	2.6E-02	1.3E+00	Low	High	High
1,1-Dichloroethene	97	2.3E+00	6.0E+02	2.0E-02	6.5E+01	2.1	1.3E-02	1.1E+00	Low	High	High
1,2-Dichloroethene - cis	97	3.5E+00	2.1E+02	4.1E-03	1.4E+02	1.9	2.8E-02	1.3E+00	Low	High	High
Carbon tetrachloride	154	8.0E-01	9.0E+01	3.0E-02	1.1E+02	2.64	2.2E-02	1.2E+00	Low	High	High

VARIABLES FOR MAGOTHY AQUIFER

Fraction Organic Carbon, foc =	0.00020		
Soil Bulk Density, Rho_b =	1.7	(cm^3/g)	(sandy)
Effective Porosity, Eta_e =	15%		
Adsorption is	"Low"	if Kd <	0.5
	"High"	if Kd >	2
	"Moderate"	if Kd is in-between	
Volatilization from Water is	"Low"	if H <	1.0E-07
	"High"	if H >	1.0E-03
	"Moderate"	if H is in-between	
Mobility is	"High"	if Rf <	1.0E+01
	"Low"	if Rf >	1.0E+03
	"Moderate"	if Rf is in-between	

NOTATION

Koc = Soil Organic Carbon/Water Partition Coefficient, cm^3/g

Kow = n-Octanol/Water Partition Coefficient, dimensionless

Kd = Soil/Water Partition Coefficient [= Koc X foc for organics], cm^3/g

Rf = Retardation Factor = 1 + (Rho_b X Kd / Eta_e), dimensionless

Notes:

g/mole = gram per mole

mg/l = milligrams per liter

mm Hg = millimeters of mercury

atm-m3/mol = atmosphere cubic meters per mole

ml/g = milliliters per gram

cm^3/g = cubic centimeters per gram

deg. C = degrees celsius

References:

ATSDR. Tox Profiles. US Department of Health and Human Services (http://atsdr.cdc.gov/toxpro2.html)

Risk Assessment Information System (http://rais.ornl.gov)

EPA Soil Screening Guidance, 1996 (http://epa.gov/superfund/resources/soil/part_5.pdf)

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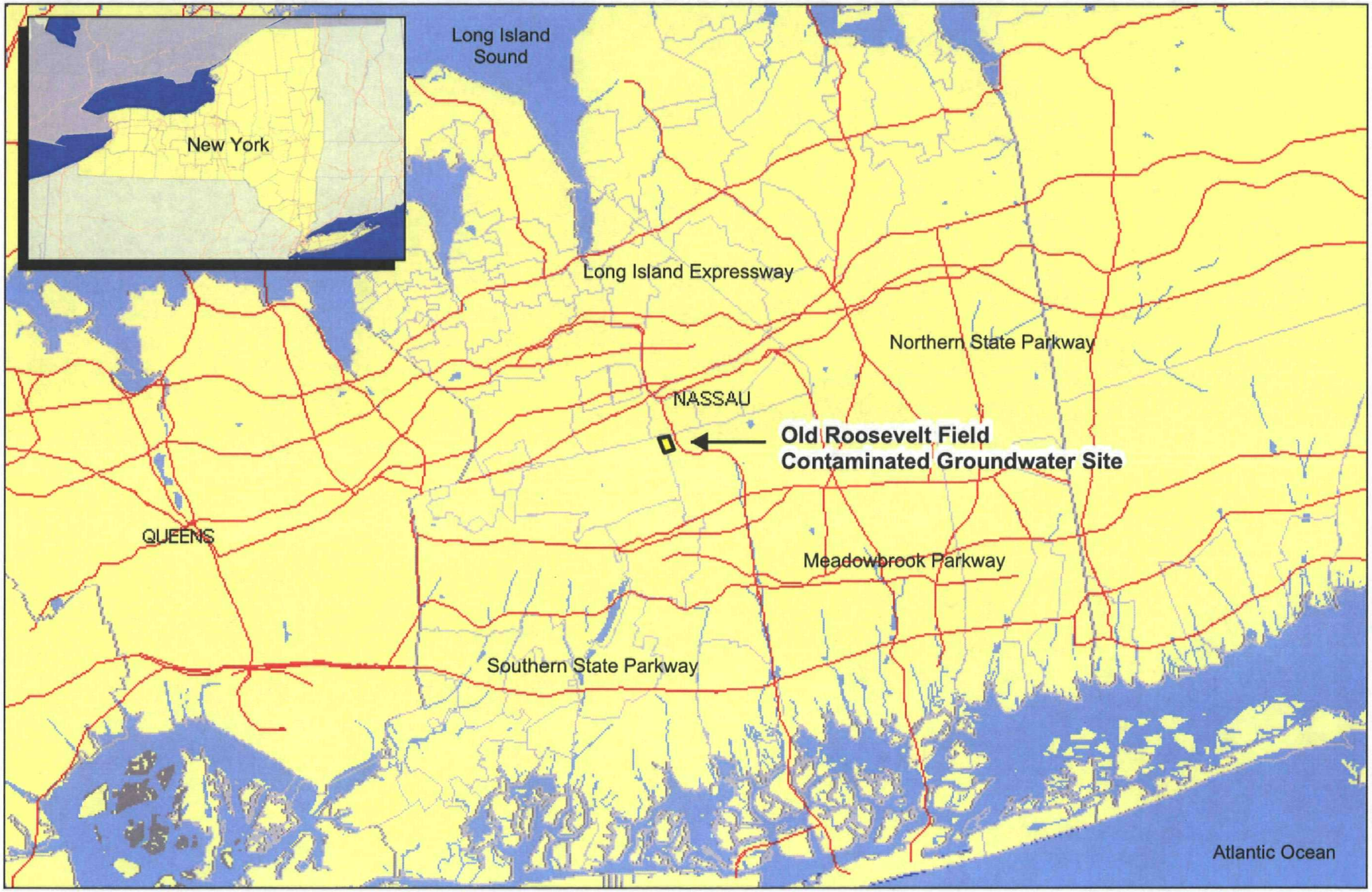
Figures



adapted from NYSDEC Interactive Mapping Gateway: http://www.nygis.state.ny.us/gateway/index.html

CDM

Figure 1-1
Site Location Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

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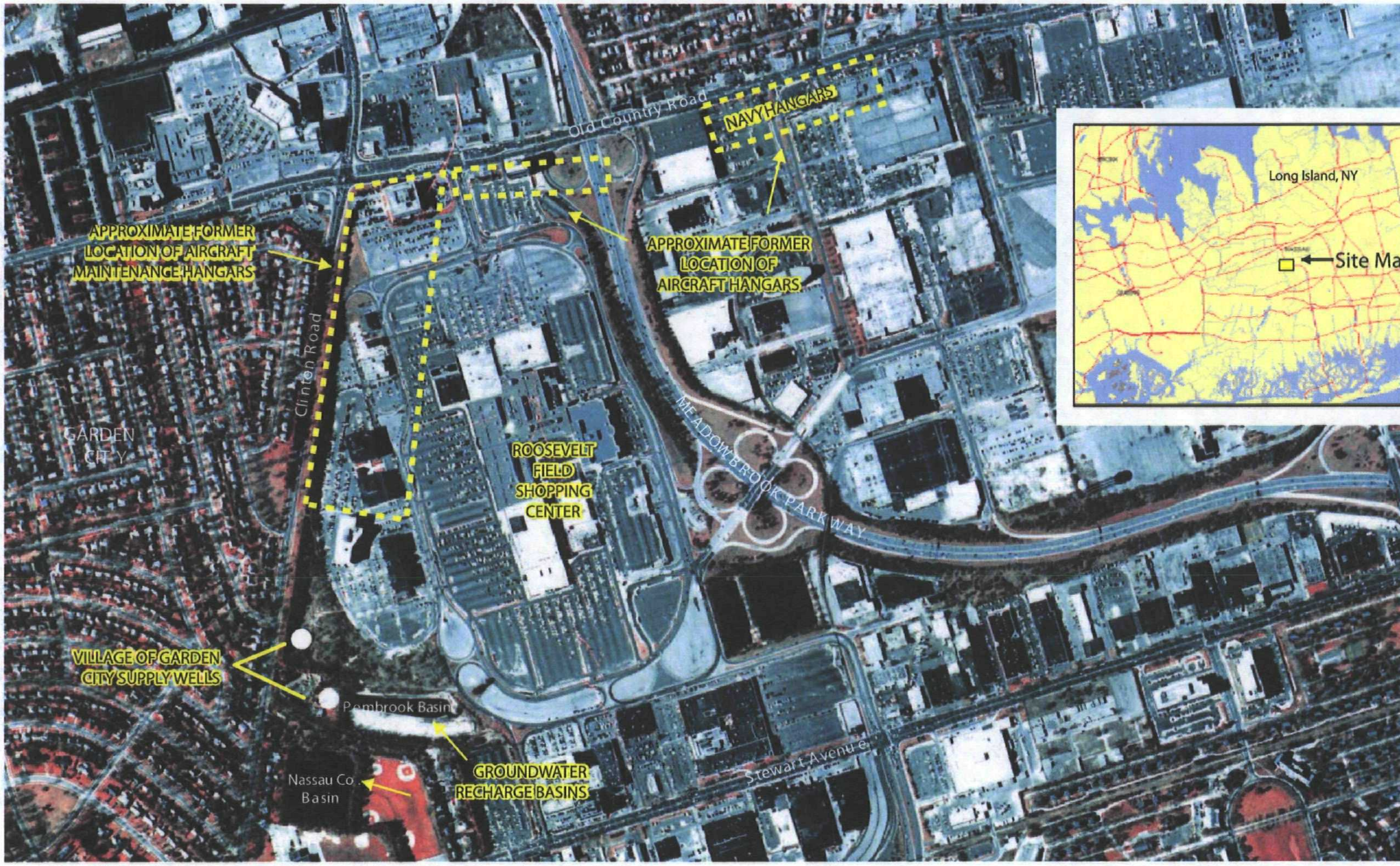

adapted from NYSDEC Interactive Mapping Gateway: http://www.nygis.state.ny.us/gateway/index.html

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0.25 0.125 0 0.25 Miles

Figure 1-2
Site Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

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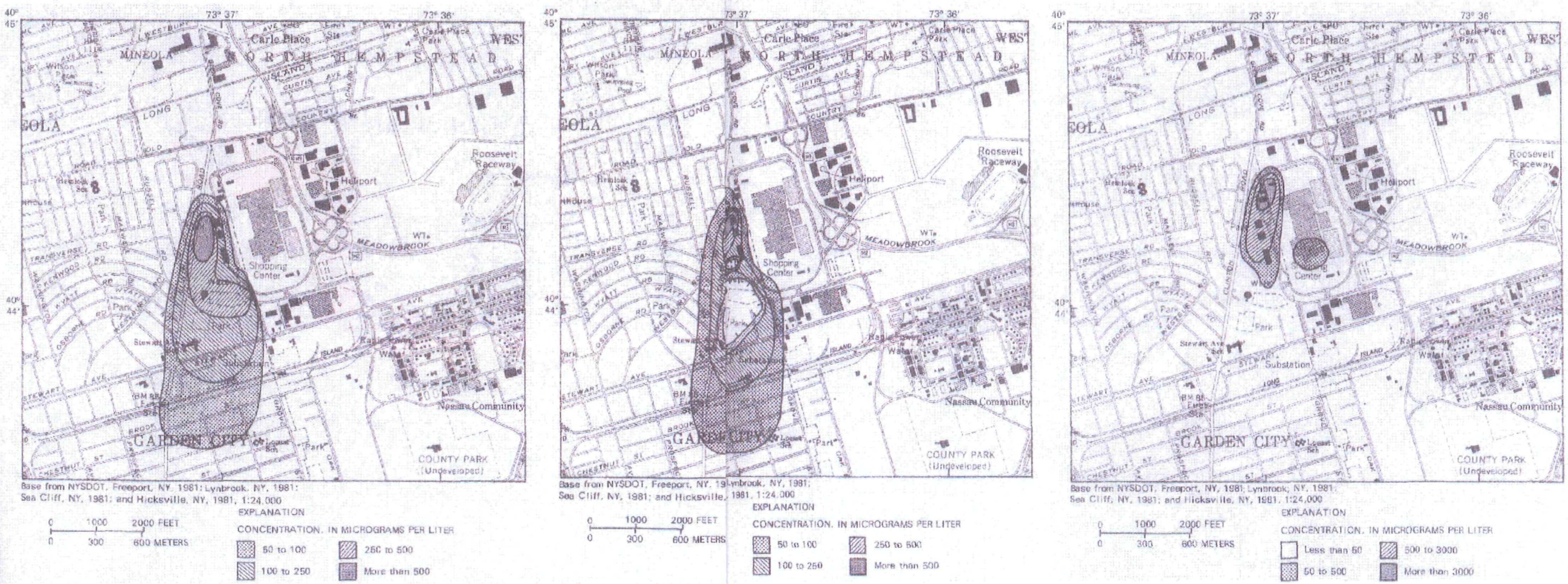


(a) TCE concentrations in the Upper Glacial Aquifer (Summer 1983)

(b) TCE concentrations in the Upper Glacial Aquifer (Spring 1984)

(c) TCE concentrations in the Magothy Aquifer (Spring 1984)

from Eckhardt and Pearsall (1989)

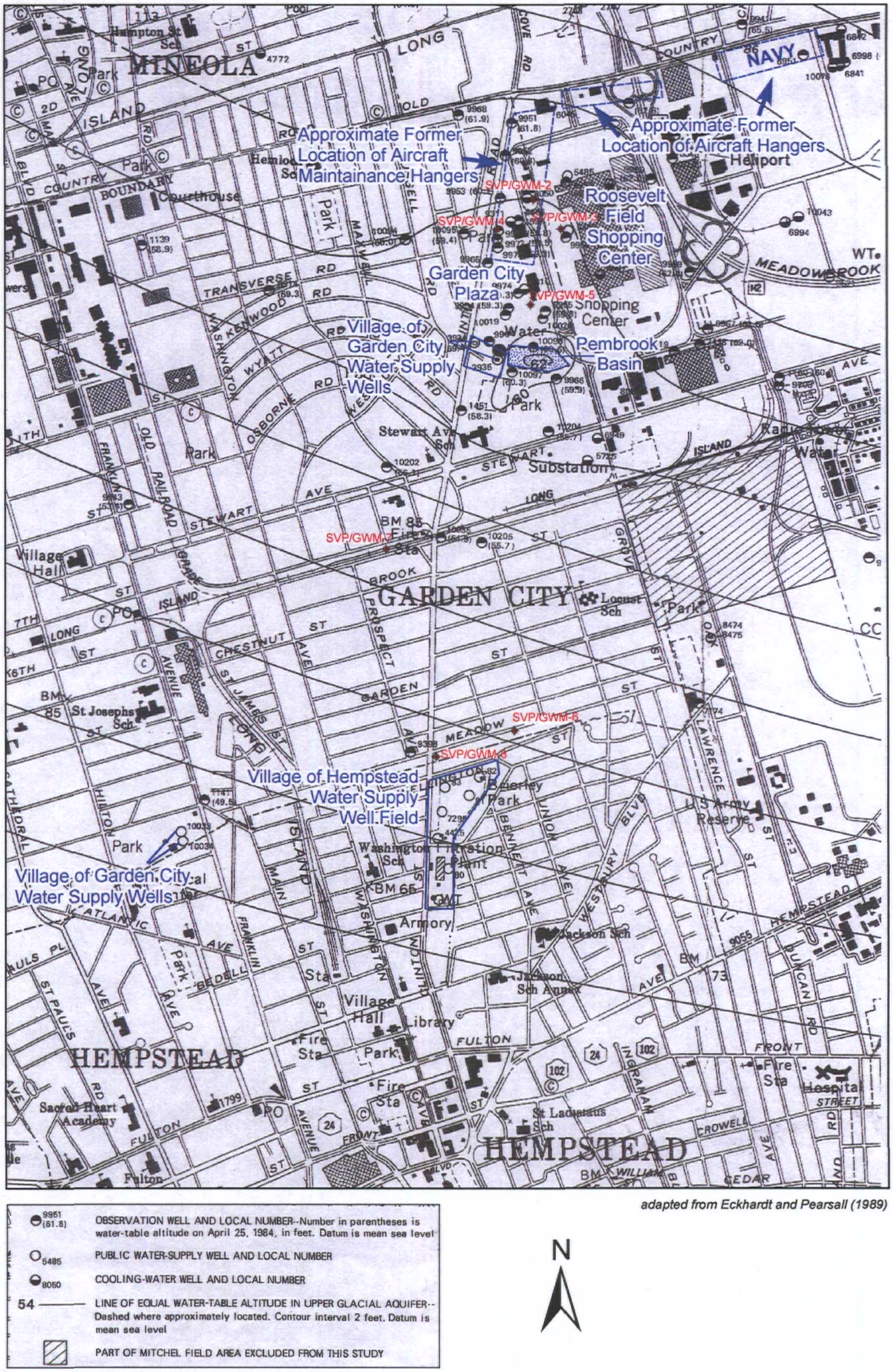
Figure 1-3
Historical Groundwater Plume Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

Figure 2-1a
Multi-port Well, Existing Monitoring Well, and Active Pumping Well Locations

Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM



SVP/GWM-5 CDM INSTALLED WELLS

Figure 2-1b
Multi-port Wells in Relation to Hempstead Well Field

CDM

Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

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Soil Gas Screening Grid Point Location

N

0 100 200 400 Feet

Figure 2-2a
Soil Gas Screening Locations
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

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Soil Gas Boring Location for VOC Analysis via method TO-15

Note: SGRF10 and SGRF11 were not collected due to underground utilities.

Feet
0 30 60 120

Figure 2-2b
Soil Gas Analytical Sample Locations
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

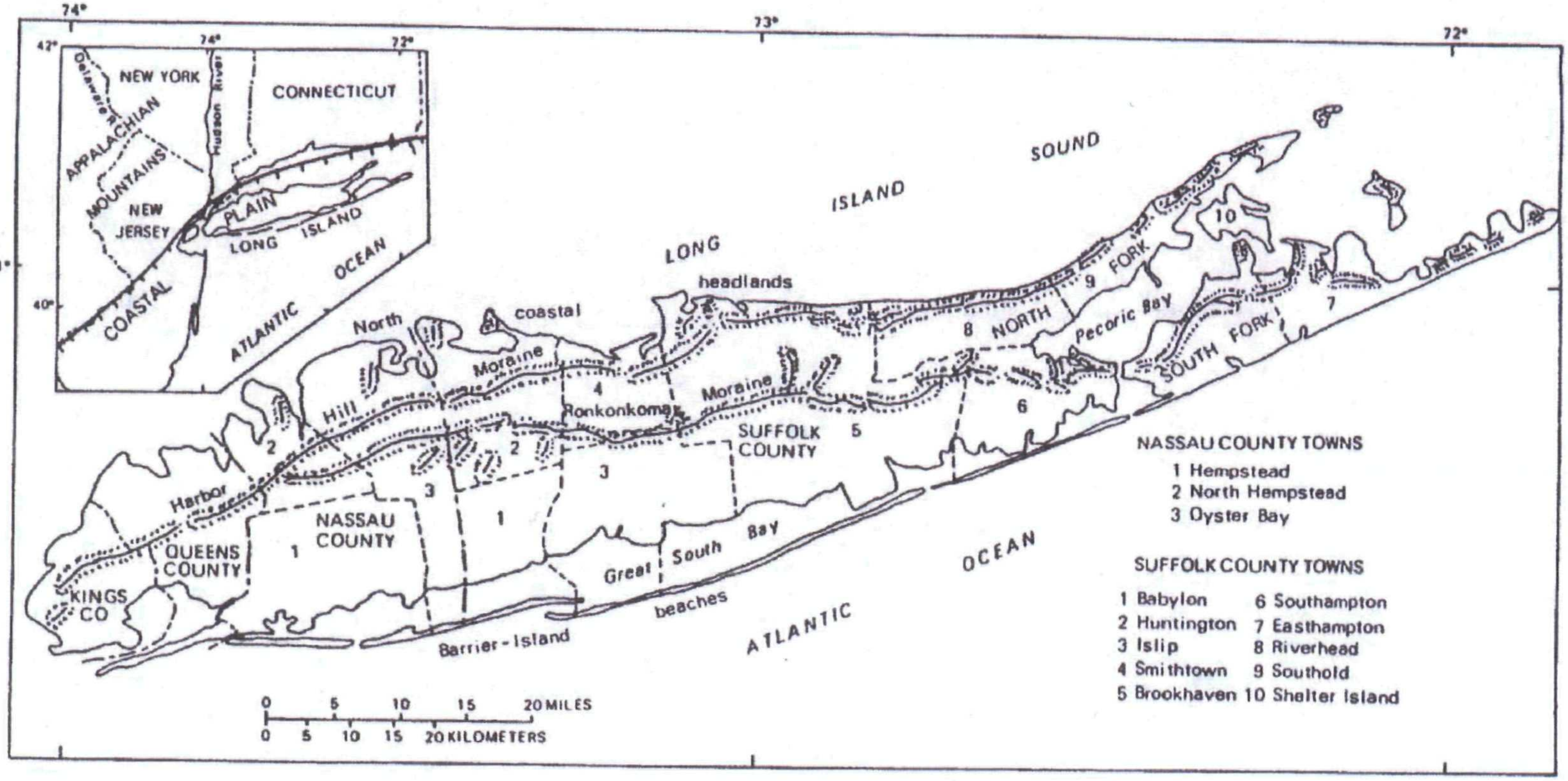

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Figure 3-1
Major Physiographic Features of Long Island
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

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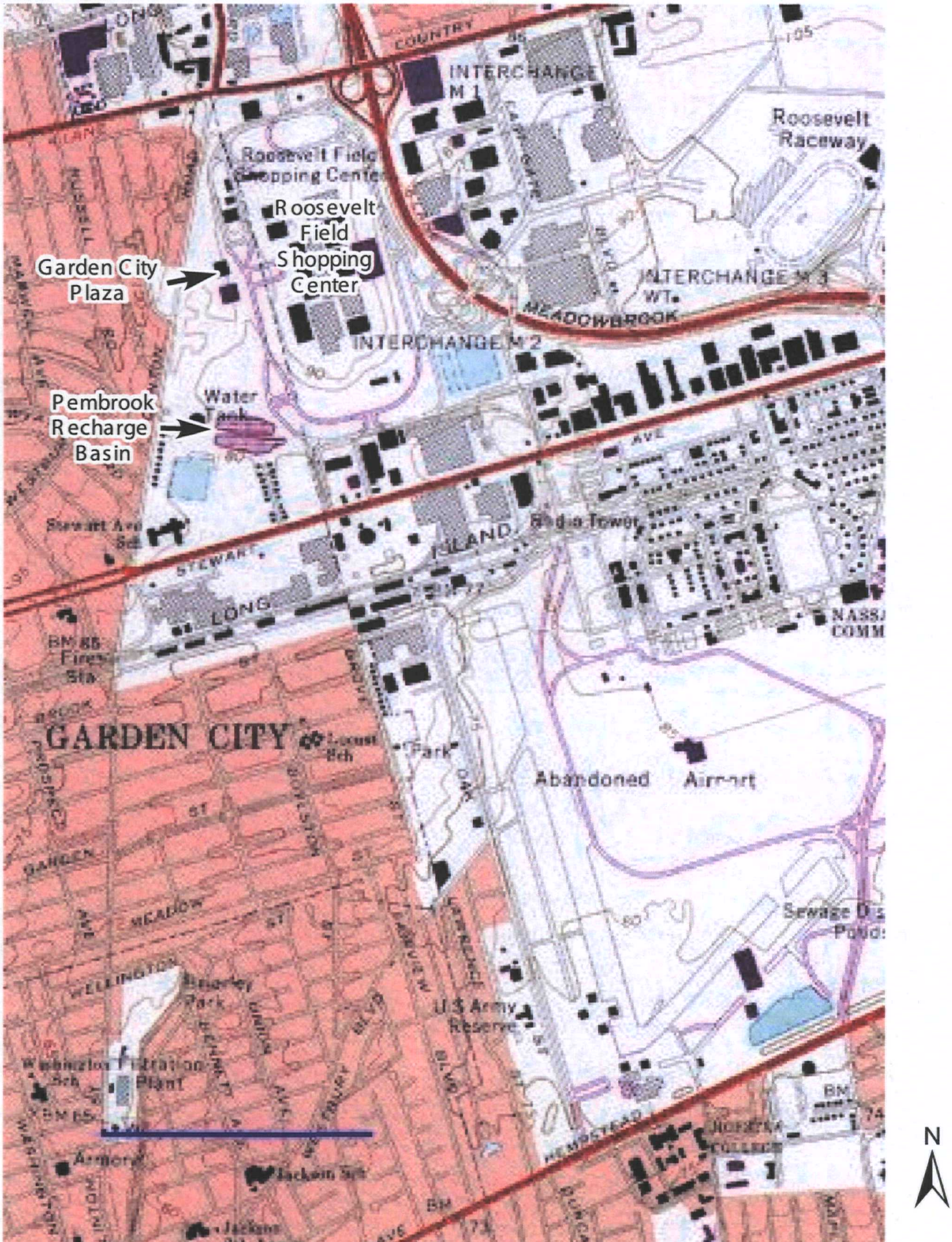


adapted from the USGS Freeport 1:24,000 Topographic Quadrangle (1979)

Contour interval = 5 feet above mean sea level

Figure 3-2
Site Topographic Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

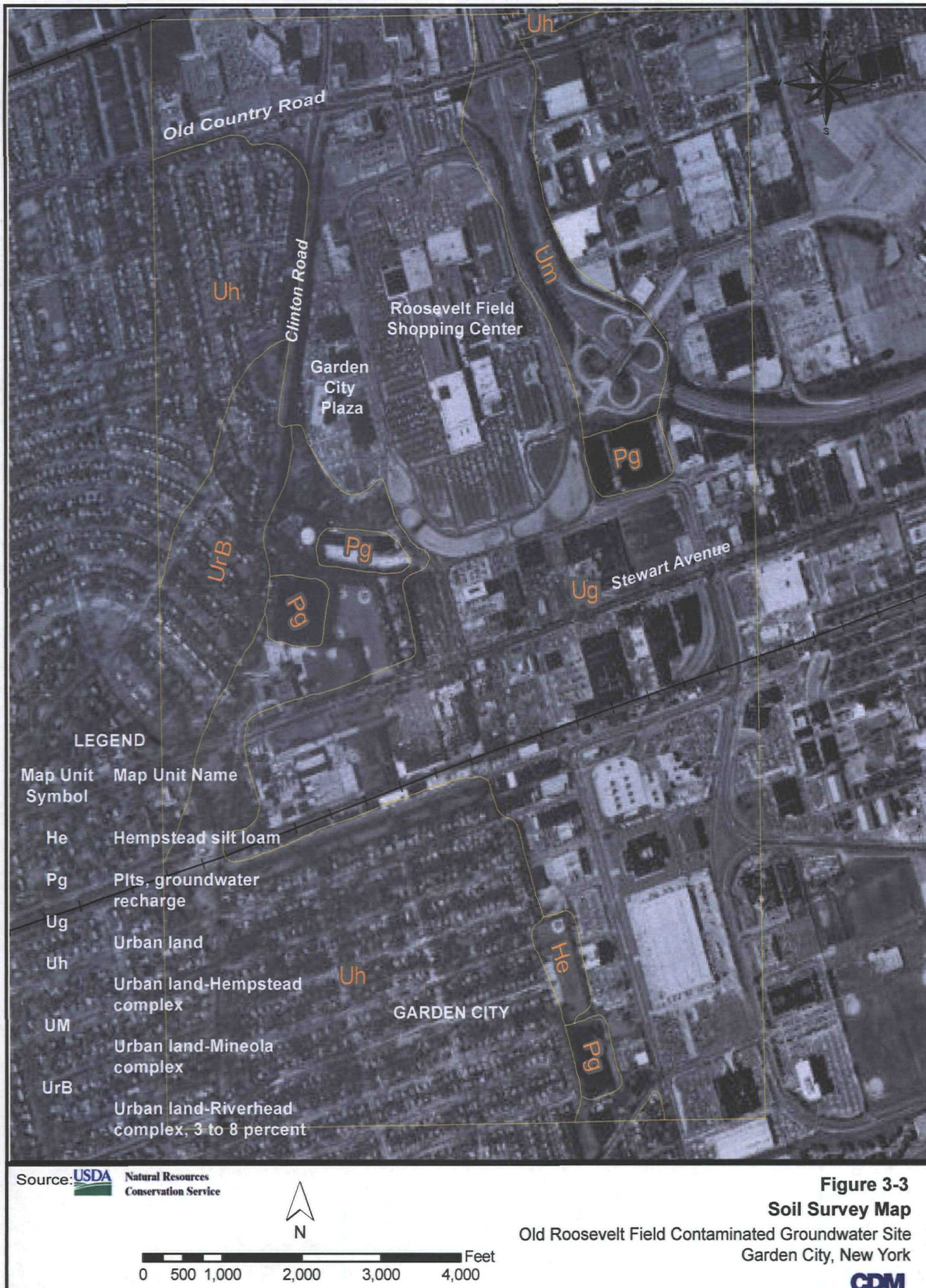
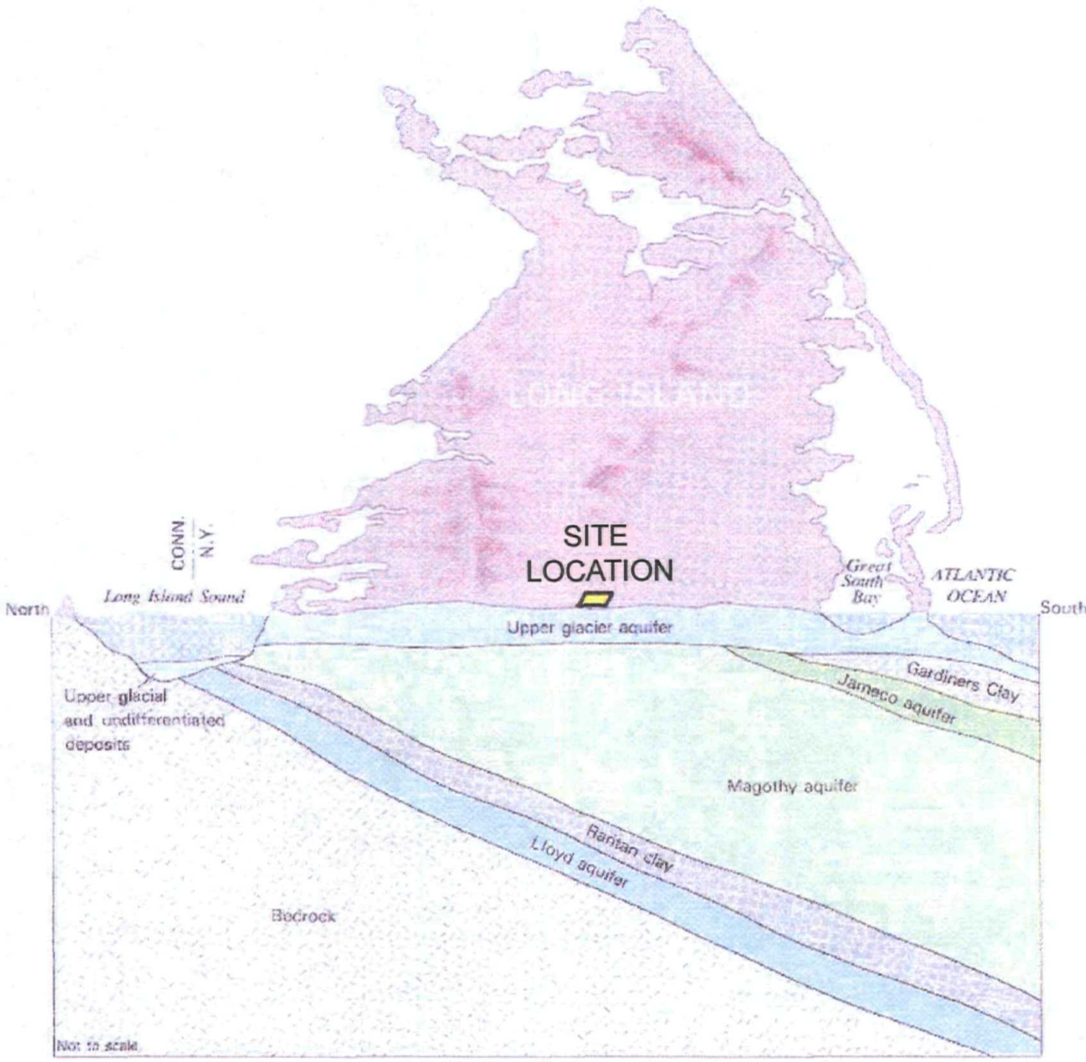


Figure 3-3
Soil Survey Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York
CDM



Modified from Franke and McClymonds (1972)

Figure 3-4
General Geologic Section of Long Island Aquifer System in Nassau County
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

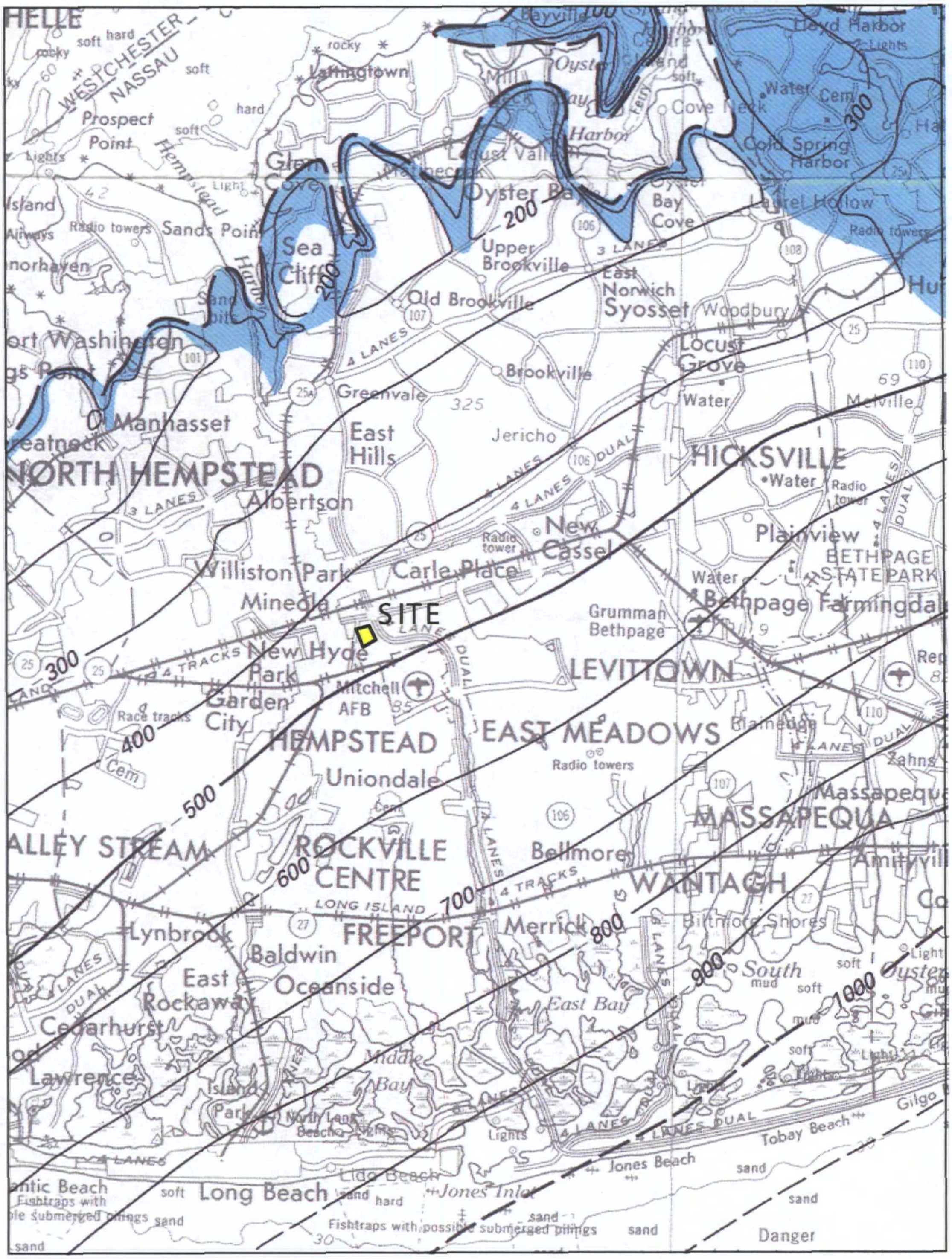
System	Series	Age	Stratigraphic Unit	Hydrostratigraphic Unit
QUATERNARY	Holocene	Postglacial	Holocene (recent) deposits	Upper glacial aquifer
	Pleistocene	Wisconsin (upper Pleistocene)	Upper Pleistocene deposits	
			"20-foot" clay	"20-foot" clay
			Upper Pleistocene deposits	Upper glacial aquifer
			unconformity	
		Sangamon	Gardiners Clay	Gardiners Clay
			unconformity	
		Pre-Sangamon	Jameco Gravel[1]	Jameco aquifer[1]
		Pre-Sangamon	Reworked Matawan-Magothy channel deposits	Upper glacial or Magothy aquifer
unconformity				
CRETACEOUS	Upper Cretaceous		Monmouth Group	Monmouth greensand
			unconformity	
			Matawan Group-Magothy Formation, undifferentiated	Magothy aquifer
			unconformity	
			Raritan Formation: Unnamed clay member	Raritan confining unit
			Raritan Formation: Lloyd Sand Member	Lloyd aquifer
unconformity				
	Paleozoic (or) Precambrian		Bedrock	Relatively impermeable bedrock

[1]Present in Nassau County Only

adapted from Krulikas (1987)

Figure 3-5
Generalized Regional Stratigraphy
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM



EXPLANATION

SHADING INDICATES LOCATION OF SUBCROP OF THE RARITAN CONFINING UNIT

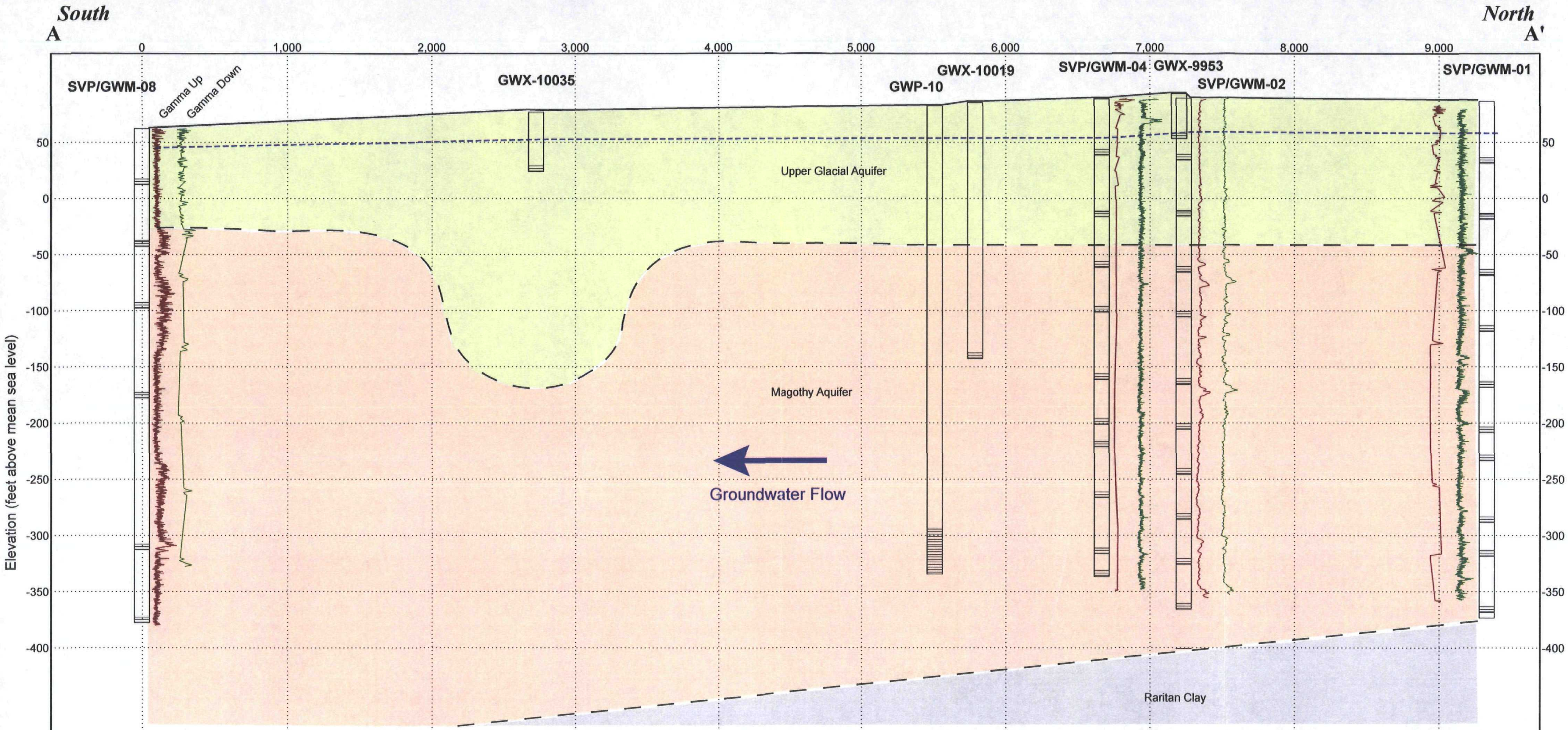
UPDIP LIMIT OF THE RARITAN CONFINING UNIT

STRUCTURE CONTOUR—Shows the upper surface of the Raritan confining unit. Dashed where approximately located. Contour interval 100 feet. National Geodetic Vertical Datum of 1929

Smolensky, et. al., 1989

Figure 3-6
Subcrop Map of Top-Raritan Clay Member
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM



LEGEND:

Screened Interval

- Gamma = Natural gamma radiation data in counts per second (CPS)
- Gamma scale is zero to 20 CPS
- "Gamma Up" = indicates data collected in the up direction
- "Gamma Down" = indicates data collected in the down direction
- Gamma logs were collected inside a steel drill rod extending to the bottom of the borehole

Water Table Surface, July 2006 (Round 2) Data

Geologic Contact, Approximate, Paleovalley in top of Magothy inferred from observations at SVP/GWM-07

Upper Glacial Aquifer, brown, fine to coarse sand and gravel with some interbedded silt and clay

Magothy Aquifer, gray, fine to coarse sand with interbedded silt, clay, and lignite

Raritan Clay, gray clay with silt and fine sand.

0 700
Horizontal Scale (feet)

0 90
Vertical Scale (feet)

Vertical Exaggeration: 8x

MULTIPORT WELL W GAMMA LOG ROOSEVELT.GPJ ROOSEVELT.GDT 11/15/06 REV.

CDM

DRAFT

Figure 3-7
Stratigraphic Cross Section
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\R1_GW_elevation.mxd

Existing Monitoring Wells
Multi-port Wells
Village of Garden City Supply Wells
35.4 Water Level Elevation
Water Level Elevation Contour, dashed where inferred
NA No Water Level Data at this elevation

N

0 250 500 1,000 Feet

Figure 3-8a
March 2006 (Round 1) Groundwater Elevation Contour Map-
Shallow Groundwater (50 feet bgs)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\R1_GW_elevation.mxd

Figure 3-8b
March 2006 (Round 1) Groundwater Elevation Contour Map-
Top of Magothy Formation (100 feet bgs)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York
CDM

300981

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\R1_GW_Plume.mxd

Existing Monitoring Wells
Multi-port Wells
Village of Garden City Supply Wells
35.4 Water Level Elevation
Groundwater Flow Direction
Water Level Elevation Contour, dashed where inferred
NA No Water Level Data at this elevation

N

0 250 500 1,000 Feet

Figure 3-8c
March 2006 (Round 1) Groundwater Elevation Contour Map-
Middle of Magothy Formation (250 feet bgs)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\R1_GW_deep.mxd

Existing Monitoring Wells

Multi-port Wells

Village of Garden City Supply Wells

Water Level Elevation Contour, dashed where inferred

NA No Water Level Data at this elevation

35.4 Water Level Elevation

Groundwater Flow Direction

N

0 250 500 1,000 Feet

Figure 3-8d

March 2006 (Round 1) Groundwater Elevation Contour Map- Deep Groundwater (400 feet bgs)

Old Roosevelt Field Contaminated Groundwater Site

Garden City, New York

CDM

300983

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\R1_PCE_TCE_resultslabels_rev1.mxd

300984

- Existing Monitoring Wells
- Multi-port Wells
- Village of Garden City Supply Wells
- A - - - A' Cross-Section Location

PCE value
TCE value } underlined values exceed MCL

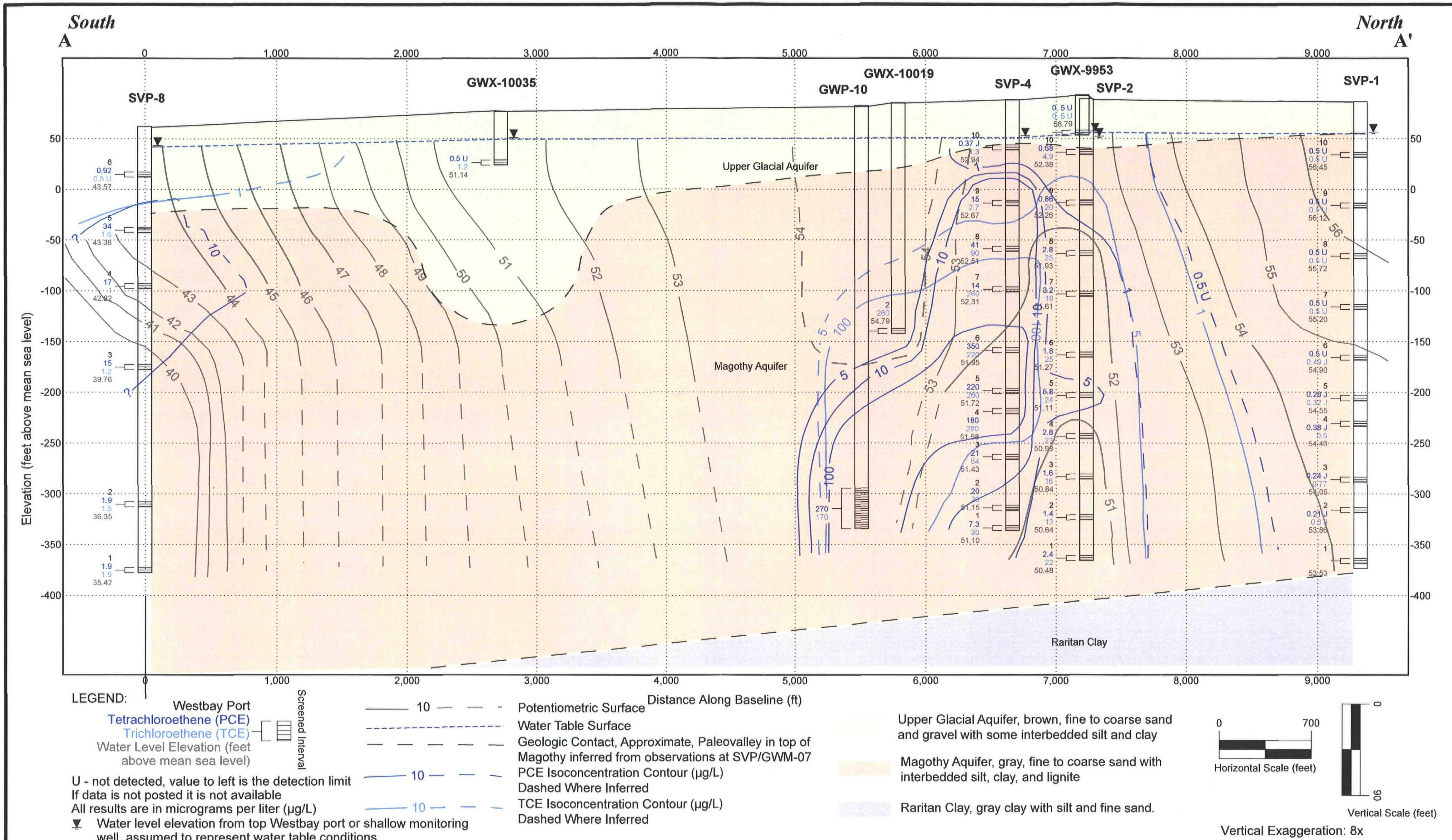
All posted values are in micrograms per liter (ug/L)
PCE = Tetrachloroethene
TCE = Trichloroethene
PCE and TCE MCL is 5 ug/L
P# = Port numbers of highest concentration
(-37 to -57) = screen interval in feet AMSL

N

0 325 650 1,300 Feet

Figure 4-1
March 2006 (Round 1) PCE/TCE Highest Concentrations by Well Location, and Cross-Section Location
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

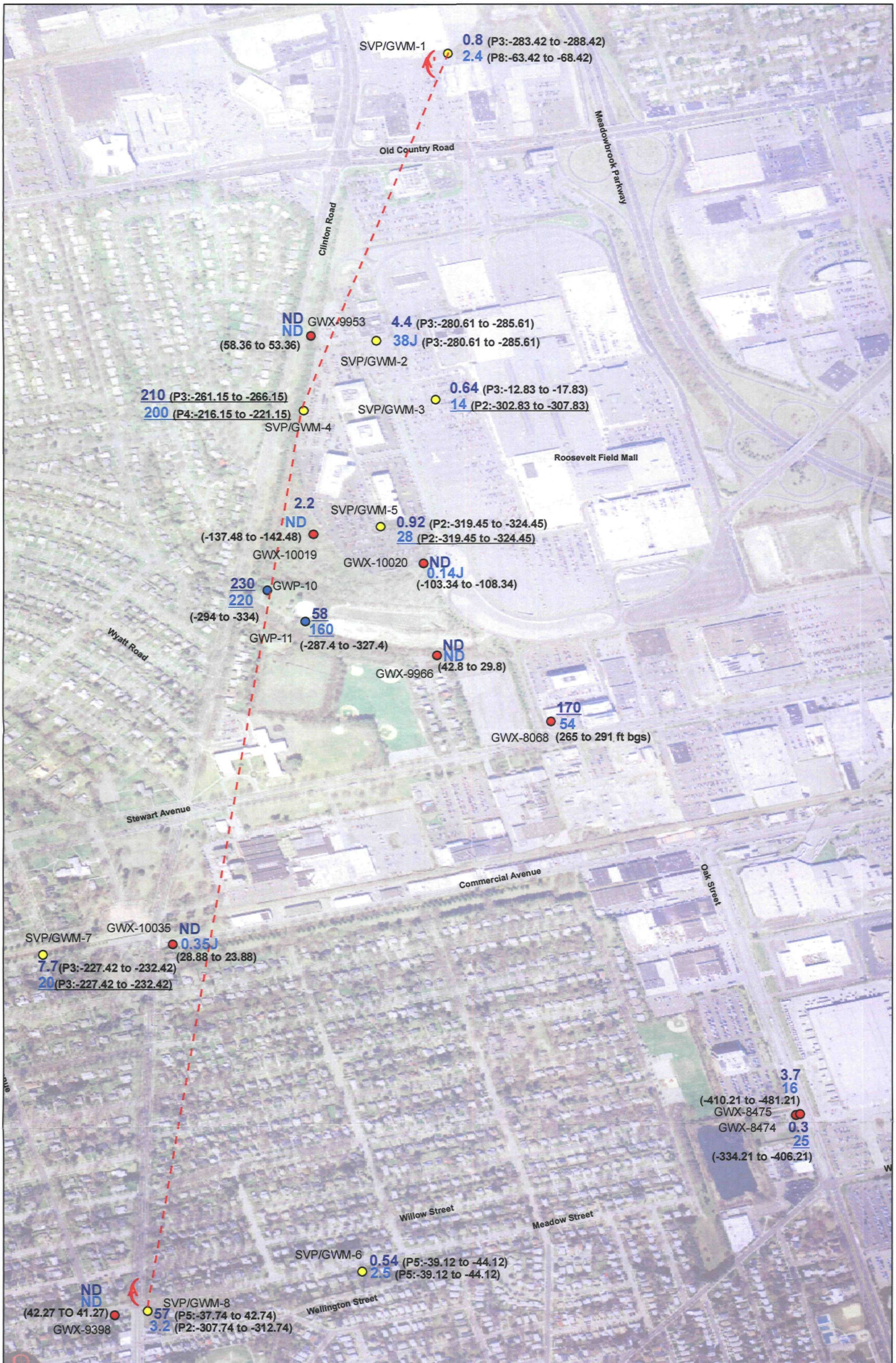


CDM

Figure 4-2
March 2006 (Round 1) PCE/TCE Plume Cross-Section Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

MULTIPORT WELL FENCE DIAGRAM ROOSEVELT.GPJ ROOSEVELT.GDT 11/07/06 REV.

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\R2_PCE_TCE_resultslabels_rev1.mxd



300986

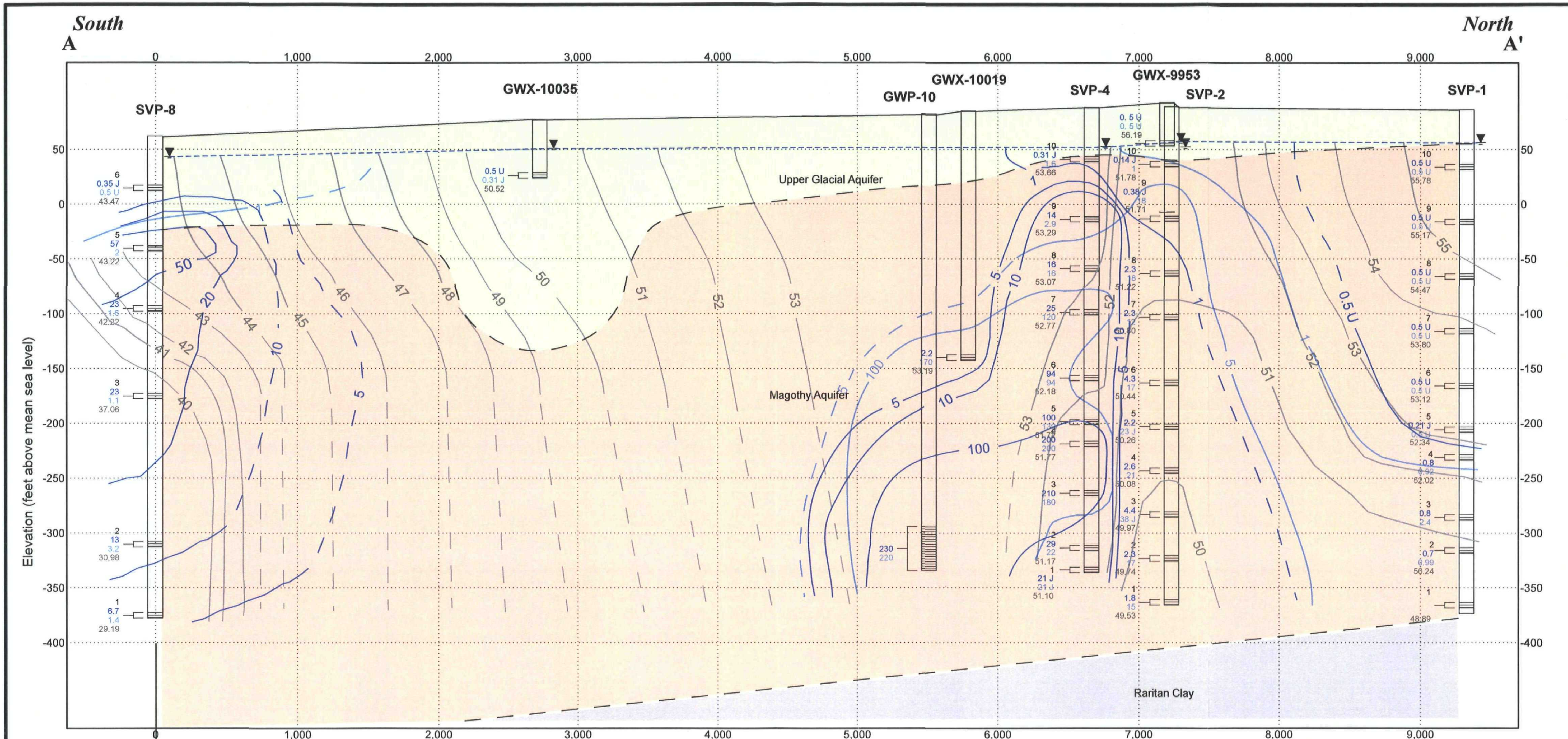
- Existing Monitoring Wells
- Multi-port Wells
- Village of Garden City Supply Wells
- A----A' Cross-Section Location
- PCE value
- TCE value } underlined values exceed MCL

All posted values are in micrograms per liter (ug/L)
PCE = Tetrachloroethene
TCE = Trichloroethene
PCE and TCE MCL is 5 ug/L
P# = Port numbers of highest concentration
(-37 to -57) = screen interval in feet AMSL
bgs = below ground surface

0 325 650 1,300 Feet

Figure 4-3
July 2006 (Round 2) PCE/TCE Highest Concentrations by Well Location, and Cross-Section Location
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM



LEGEND:

Westbay Port
Tetrachloroethene (PCE)
Trichloroethene (TCE)
Water Level Elevation (feet above mean sea level)
Screened Interval

U - not detected, value to left is the detection limit
If data is not posted it is not available
All results are in micrograms per liter (µg/L)
Water level elevation from top Westbay port or shallow monitoring well, assumed to represent water table conditions.

10 — Potentiometric Surface
Water Table Surface
Geologic Contact, Approximate, Paleovalley in top of Magothy inferred from observations at SVP/GWM-07
10 — PCE Isoconcentration Contour (µg/L) Dashed Where Inferred
10 — TCE Isoconcentration Contour (µg/L) Dashed Where Inferred

Upper Glacial Aquifer, brown, fine to coarse sand and gravel with some interbedded silt and clay
Magothy Aquifer, gray, fine to coarse sand with interbedded silt, clay, and lignite
Raritan Clay, gray clay with silt and fine sand.

0 700
Horizontal Scale (feet)

0 90
Vertical Scale (feet)

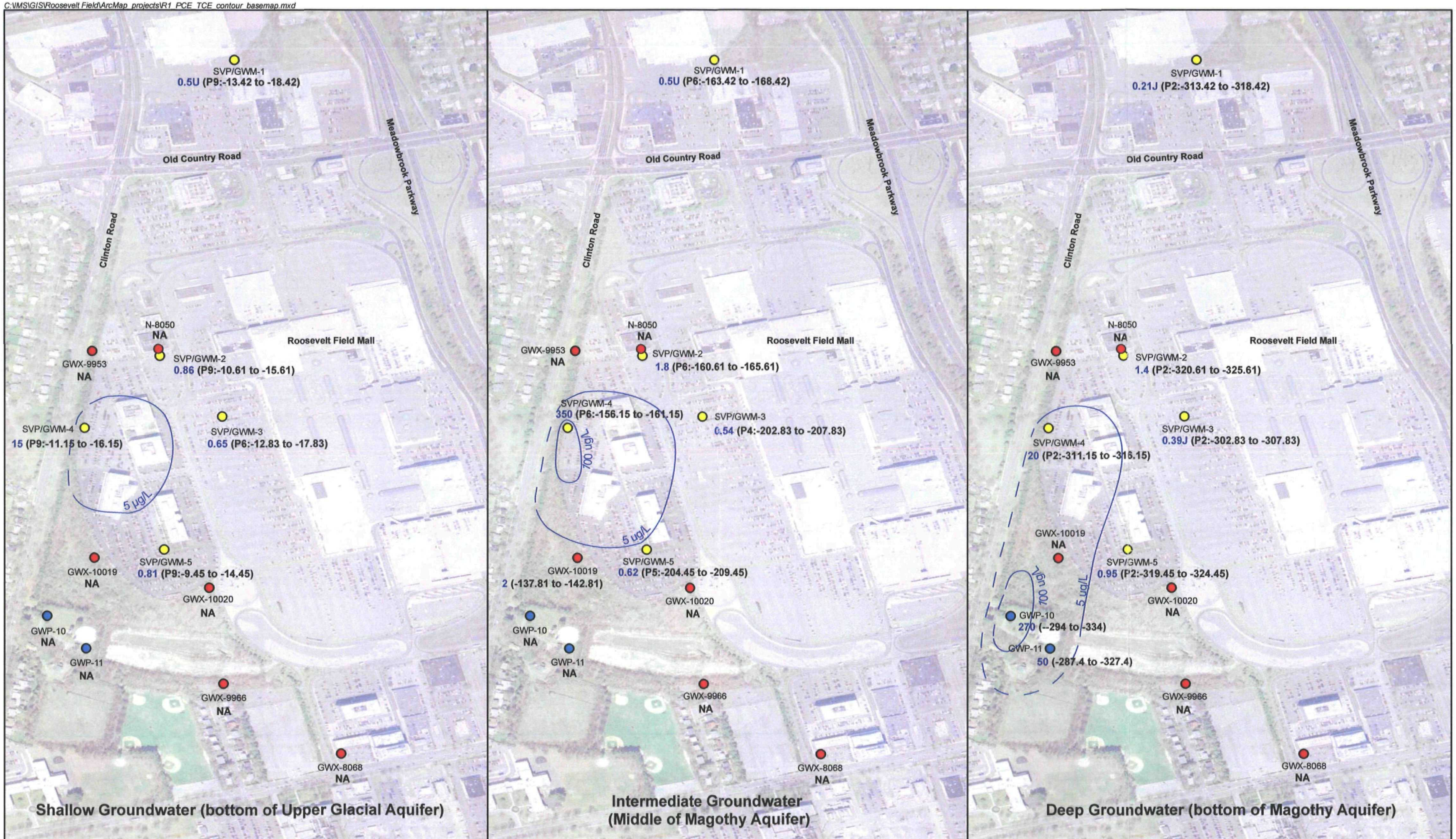
Vertical Exaggeration: 8x

MULTIPORT WELL FENCE DIAGRAM ROOSEVELT.GPJ ROOSEVELT.GDT 11/08/06 REV.

CDM

Figure 4-4
July 2006 (Round 2) PCE/TCE Plume Cross-Section Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

300987



- Existing Wells
- Multiport Wells
- Supply Wells
- PCE Contour (µg/L), dashed where inferred

PCE value (Port #: screen interval in feet AMSL)

All posted values are in micrograms per liter (µg/L)
PCE = Tetrachloroethene
NA = Not applicable - no data exists at elevation range
MCL = 5 µg/L

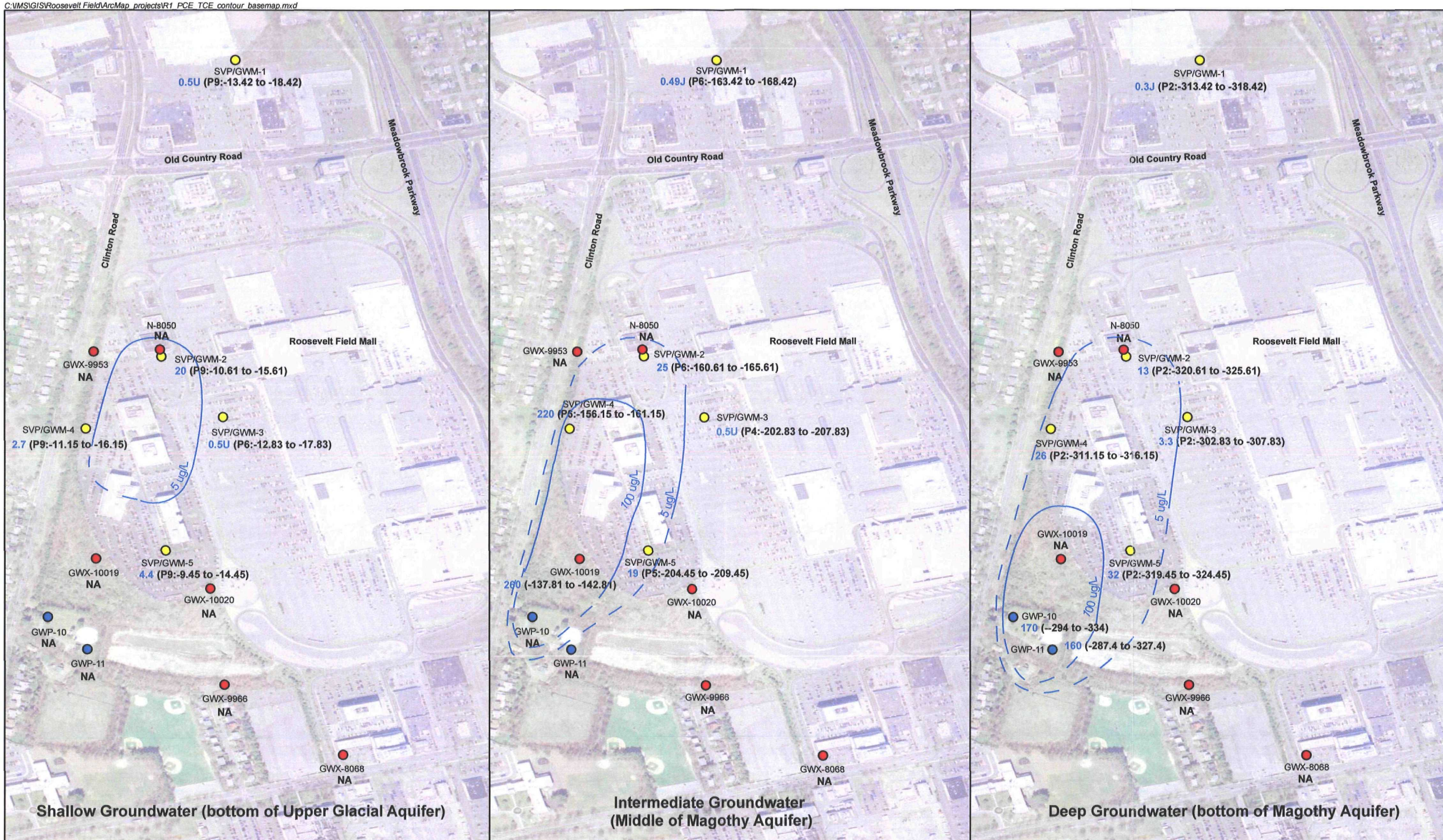
N

0 500 1,000 2,000 Feet

Figure 4-5
March 2006 (Round 1) PCE Isocontours at Select Elevations
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

C:\MS\GIS\Roosevelt Field\ArcMap_projects\R1_PCE_TCE_contour_basemap.mxd



Existing Wells

Multiport Wells

Supply Wells

PCE Contour (µg/L), dashed where inferred.

TCE value (Port #: screen interval in feet AMSL)

All posted values are in micrograms per liter (µg/L)

PCE = Tetrachloroethene

NA = Not applicable - no data exists at elevation range

MCL = 5 µg/L

N

Feet

0 500 1,000 2,000

Figure 4-6

March 2006 (Round 1) TCE Isocontours at Select Elevations

Old Roosevelt Field Contaminated Groundwater Site

Garden City, New York

CDM

300989

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\Roosevelt 15 ft Screening Results.mxd

- Soil gas screening point with grid point number and screening reading in parts per billion per volume (ppbv)
- Soil gas screening point with outdoor building boring location number
- Screening results at location exceed 10 ppbv
- Existing Wells and Multi-port Wells included for Spatial Reference

Notes: H19 and H18 were combined at location H-19
bgs = below ground surface
All soil gas measurements were made with a ppbRAE

N

0 125 250 500 Feet

Figure 4-7
Soil Gas Total VOC Screening Results - 15 feet bgs
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

300990

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\Roosevelt 35 ft Screening Results_revised.mxd

- Soil gas screening point with grid point number and screening reading in parts per billion per volume (ppbv)
- Soil gas screening point with outdoor building boring location number
- Screening results at location exceed 10 ppbv
- Existing Wells and Multi-port Wells include for Spatial Reference

Notes: H19 and H18 were combined at location H-19
bgs = below ground surface
All soil gas measurements were made with a ppbRAE

N

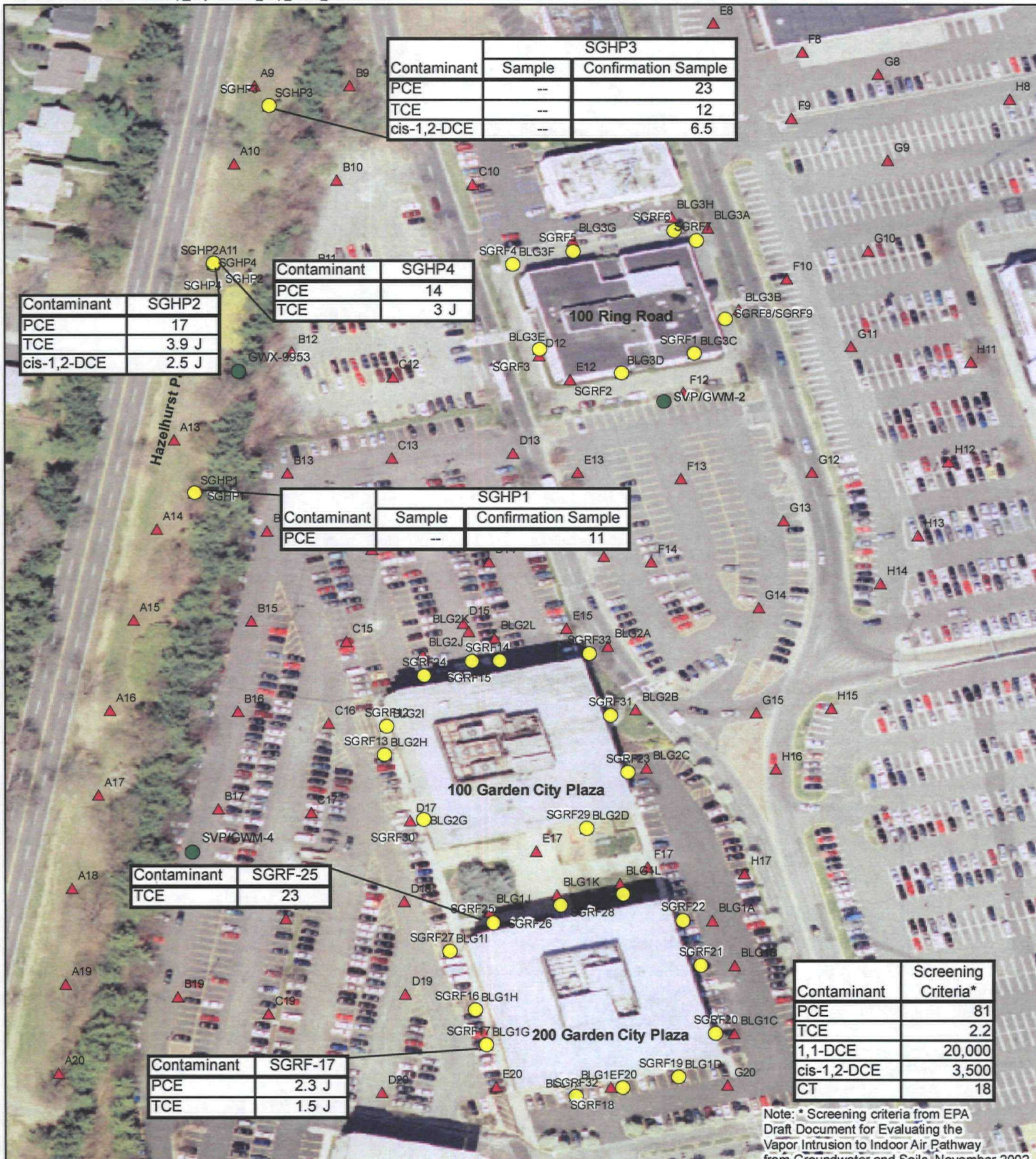
0 140 280 560 Feet

Figure 4-8
Soil Gas Total VOC Screening Results - 35 feet bgs
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

300991

C:\IMS\GIS\Roosevelt Field\ArcMap_projects\base_map_boxes_rev1.mxd



Contaminant	SGHP3 Sample	SGHP3 Confirmation Sample
PCE	--	23
TCE	--	12
cis-1,2-DCE	--	6.5

Contaminant	SGHP4
PCE	14
TCE	3 J

Contaminant	SGHP2
PCE	17
TCE	3.9 J
cis-1,2-DCE	2.5 J

Contaminant	SGHP1 Sample	SGHP1 Confirmation Sample
PCE	--	11

Contaminant	SGRF-25
TCE	23

Contaminant	SGRF-17
PCE	2.3 J
TCE	1.5 J

Contaminant	Screening Criteria*
PCE	81
TCE	2.2
1,1-DCE	20,000
cis-1,2-DCE	3,500
CT	18

Note: * Screening criteria from EPA Draft Document for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002.

- Soil Gas Boring Location, collected at 15 feet bgs, for VOC Analysis via method TO-15
- Existing Monitoring Wells and Multi-port Wells Included for Spatial Reference
- Soil gas screening locations provided for reference.

Notes
SGRF10 and SGRF11 were not collected due to underground utilities.
All values are in micrograms per cubic meter (µg/m3)

J = Estimated Value
U = Non Detect
CT = Carbon Tetrachloride
PCE = Tetrachloroethene
TCE = Trichloroethene
1,1-DCE = 1,1 Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

N

0 75 150 300 Feet

Figure 4-9
TO-15 Site-Related VOC Results - Outdoor Building Soil Gas Samples

Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

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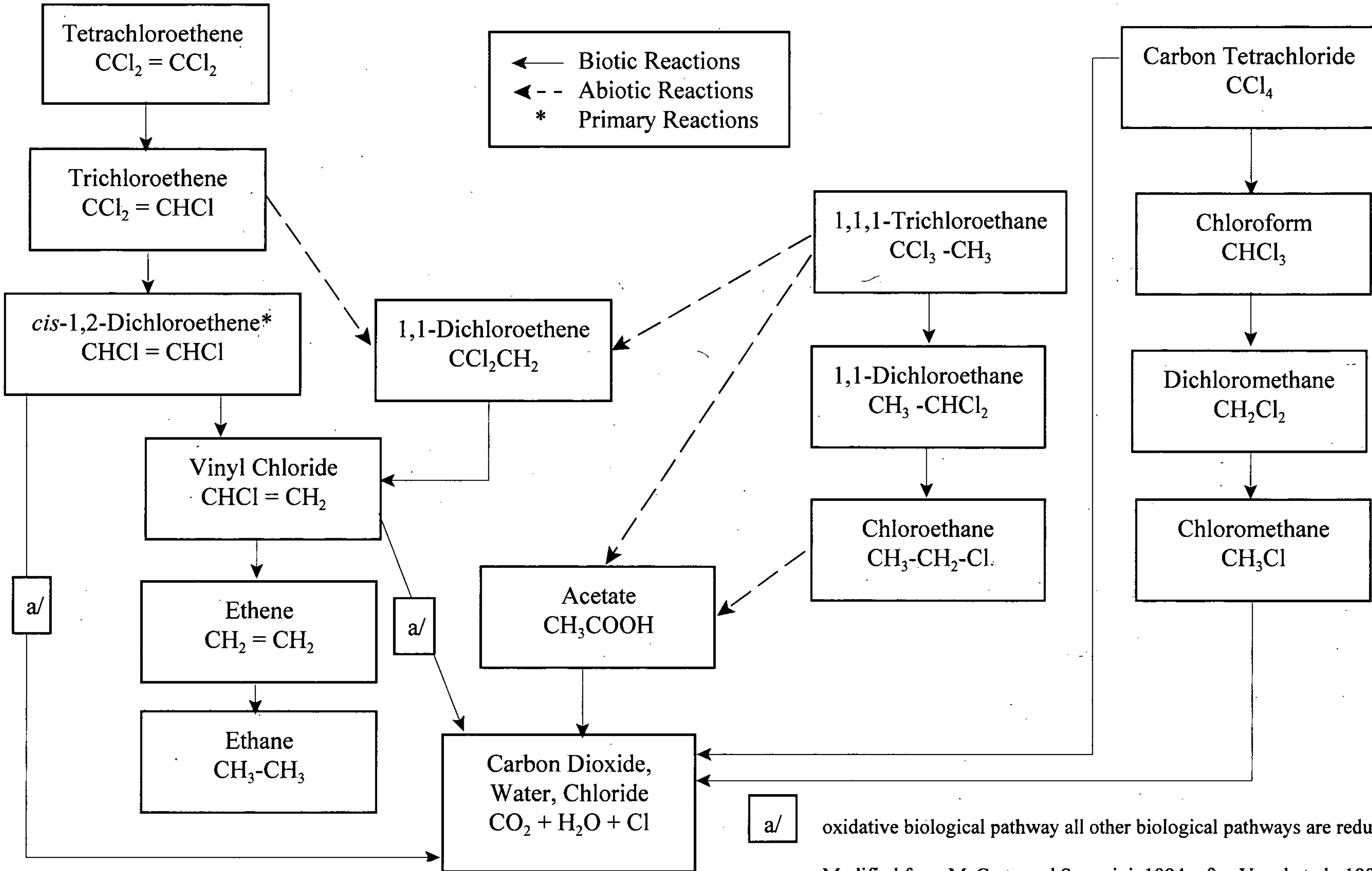

a/ oxidative biological pathway all other biological pathways are reductive

Modified from McCarty and Semprini, 1994; after Vogel et al., 1987

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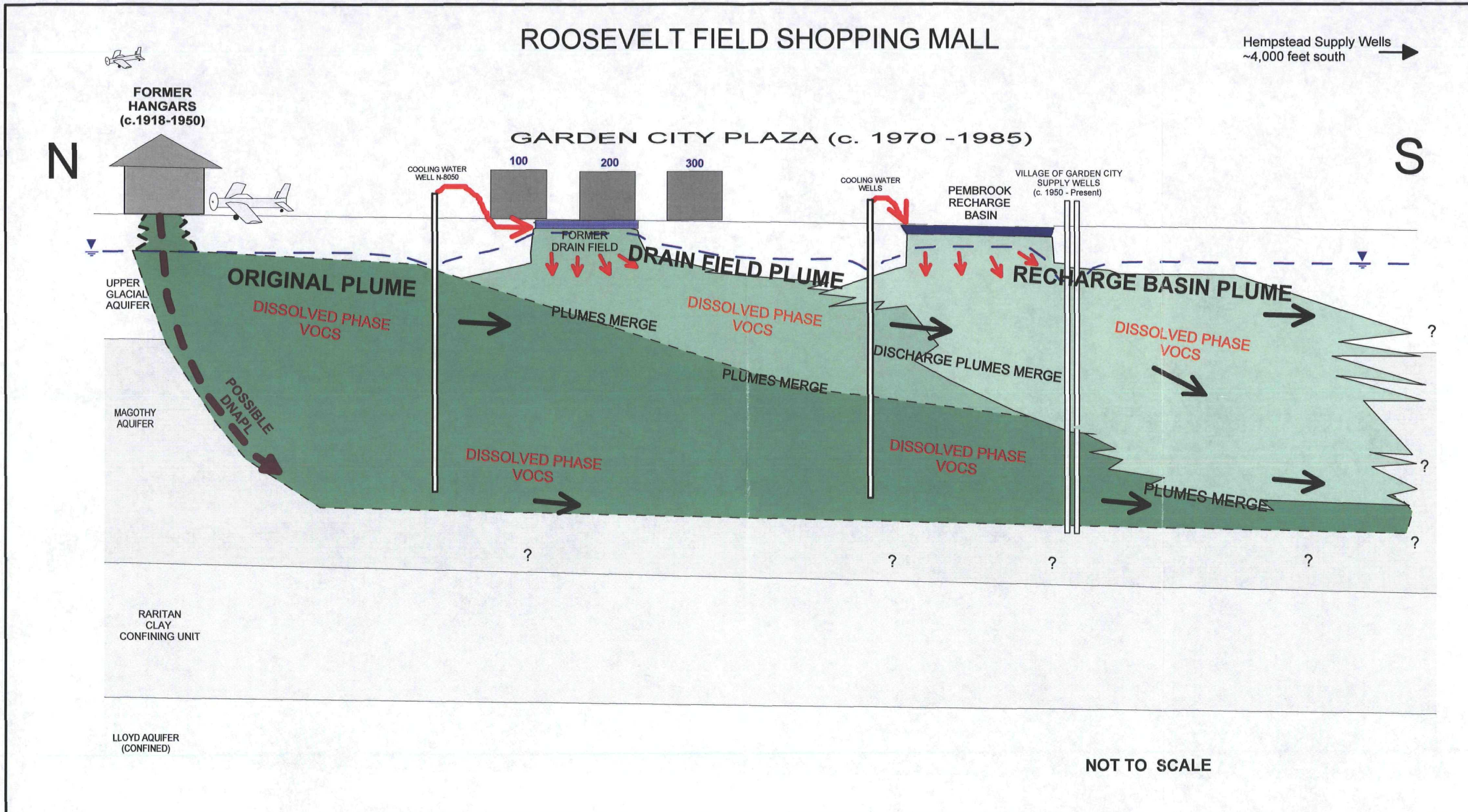
Figure 5-1
Abiotic and Biological Transformation Pathways for Selected Chlorinated Solvents
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

300993



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WATER TABLE

CONTAMINANT MIGRATION DIRECTION

DNAPL (POSSIBLE)

CONTAMINATED GW REINTRODUCED TO SURFACE AQUIFER

Figure 5-2
Conceptual Site Model - Historical Conditions
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

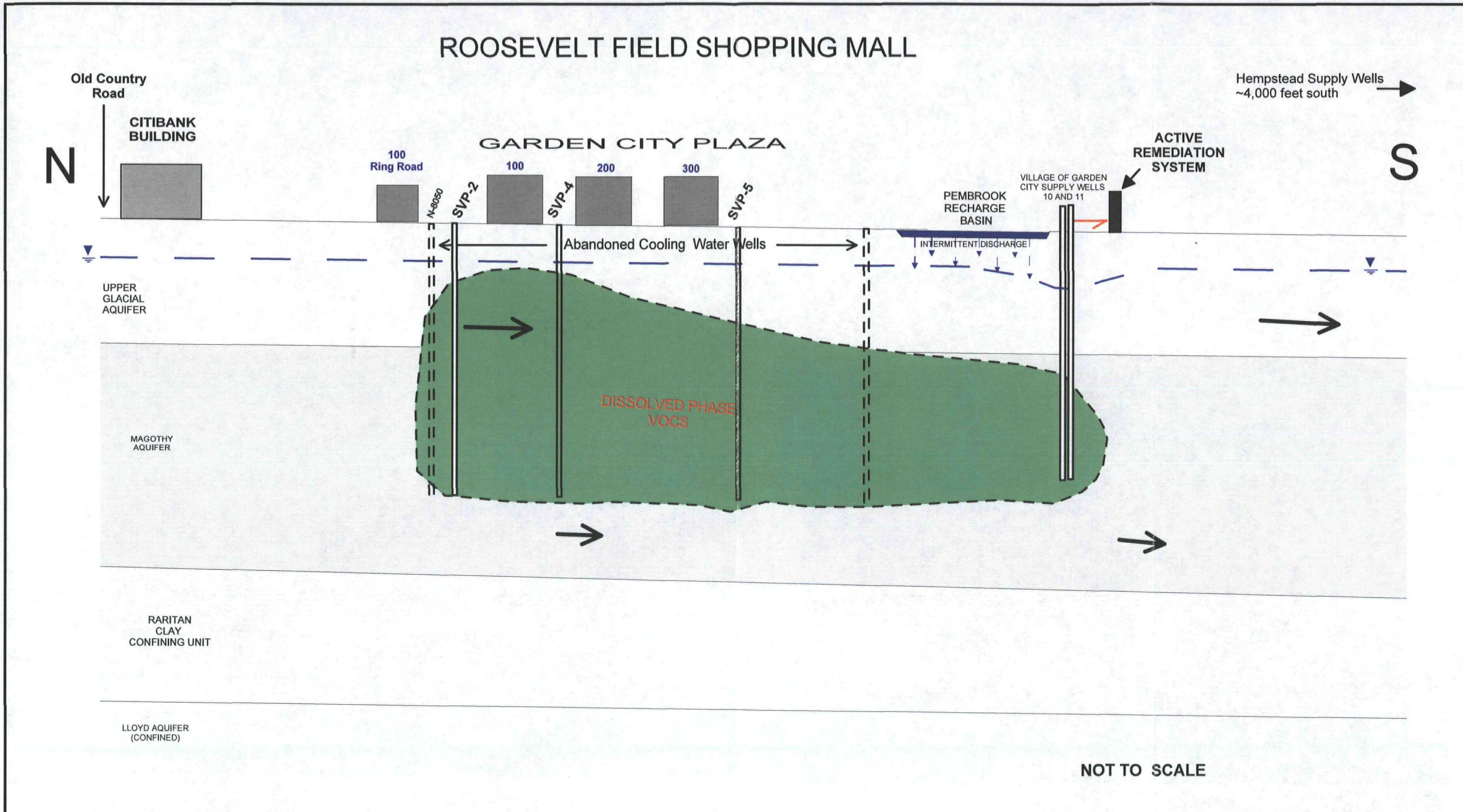

Figure 5-3
Conceptual Site Model - Current Conditions
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York